

EVA Checklist

Mission Operations Directorate EVA, Robotics, and Crew Systems Operations Division

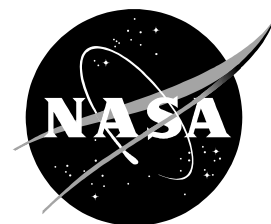
Generic, Rev H
March 4, 2005

NOTE

For STS-114 and subsequent (chronological)
flights per current schedule.

National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas



EVA CHECKLIST	GENERIC, REV H (Mar 4, 2005)
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PCN-9 (June 15, 2007) Sheet 1 of 1

List of Implemented Change Requests (482s):


EVA-1749 MULTI-1787
EVA-1750
EVA-1751
EVA-1752

<p>NOTE For STS-118 and subsequent flights</p>
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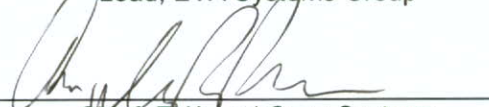
Incorporate the following:

1. Replace iii thru vi
2. Replace 1-3 thru 1-10
3. Replace 4-5 and 4-6
4. Replace 8-1 and 8-2
After 8-6, add 8-7 and 8-8
5. Replace 10-7 and 10-8

Prepared by: 
Book Manager

Approved by:  FOR TRICA MAER
Lead, EVA Systems Group

 for Randy McDaniel
Lead, EVA Task Group

Accepted by: 
Chief, EVA and Crew Systems
Operations Branch

Encl: 20 pages

File this PCN immediately behind the front cover as a permanent record

EVA CHECKLIST	GENERIC, REV H (Mar 4, 2005)
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PCN-8 (May 22, 2007) Sheet 1 of 1

List of Implemented Change Requests (482s):

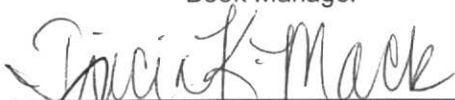
EVA-1747
EVA-1748

<p align="center">NOTE For STS-117 and subsequent flights</p>
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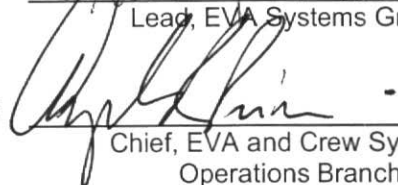
Incorporate the following:

1. Replace iii and iv
2. Replace 9-3 thru 9-6
3. Replace 10-7 thru 10-10

Prepared by: 
Book Manager

Approved by: 
Lead, EVA Systems Group

 for Randal McDaniel
Lead, EVA Task Group

Accepted by: 
Chief, EVA and Crew Systems
Operations Branch

Encl: 10 pages

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EVA CHECKLIST

GENERIC, REV H (Mar 4, 2005)

PCN-7 (Feb 20, 2007) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1742 EVA-1745
EVA-1743 EVA-1746
EVA-1744

NOTE

For STS-117 and subsequent flights


Incorporate the following:

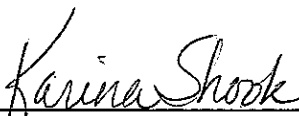
1. Replace iii thru vi
2. Replace 3-1 and 3-2, 3-7 thru CC 3-10
3. Replace 4-7 thru 4-10
4. Replace section 8 (6 pages)
5. Replace section 9 (6 pages)
6. Replace 10-1 and 10-2
After 10-4, add 10-4a and 10-4b
Replace 10-11 and 10-12

Prepared by:

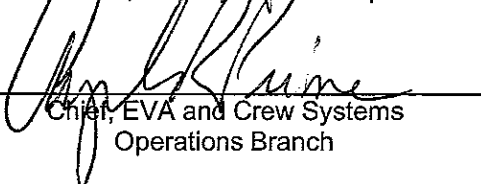

Book Manager

Approved by:


Lead, EVA Systems Group


Lead, EVA Task Group
for Randall McDaniel

Accepted by:


Chief, EVA and Crew Systems
Operations Branch

Encl: 32 pages

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EVA CHECKLIST

GENERIC, REV H (Mar 4, 2005)

PCN-6 (Nov 10, 2006) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1722
EVA-1723
EVA-1724
EVA-1735
EVA-1736

NOTE

For STS-116 and subsequent flights

Incorporate the following:

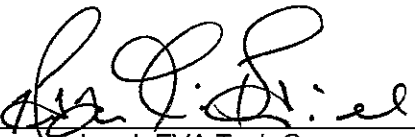
1. Replace iii and iv
2. Replace 3-3 thru 3-8
3. Replace 4-5 and 4-6
4. Replace 10-9 and 10-10
5. Replace 11-1 thru 11-4
6. Replace 15-9 and 15-10, 15-13 and 15-14

Prepared by:

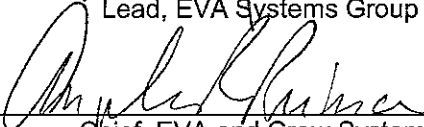

Book Manager

Approved by:


Lead, EVA Systems Group


Lead, EVA Task Group

Accepted by:


Chief, EVA and Crew Systems
Operations Branch

Encl: 20 pages

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EVA CHECKLIST

GENERIC, REV H (Mar 4, 2005)

PCN-5 (Aug 17, 2006) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1686 EVA-1716
EVA-1688
EVA-1689
EVA-1690

NOTE

For STS-115 and subsequent flights

Incorporate the following:

1. Replace iii and iv
2. Replace 1-3 thru 1-8
3. Replace 3-3 thru 3-8
4. Replace 4-5 thru 4-8
5. Replace 12-3 and 12-4
6. Replace 19-9 and 19-10

Prepared by:

Paul S. Beck 8-7-06
Book Manager

Approved by:

Trigian Mack 8/7/06
Lead, EVA Systems Group

Steve Peltier 8/8/06
Lead, EVA Task Group

Accepted by:

Myke Koch 8/8/06
Chief, EVA and Crew Systems
Operations Branch

Encl: 22 pages

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EVA CHECKLIST

GENERIC, REV H (Mar 4, 2005)

PCN-4 (June 12, 2006) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1654
EVA-1655
EVA-1656
EVA-1667
EVA-1680

NOTE

For STS-121 and subsequent flights

Incorporate the following:

1. Replace iii thru viii
2. Replace 1-3 thru 1-8
3. Replace section 3 (12 pages)
4. Replace 4-1 thru 4-10
After 4-10, add 4-11 and 4-12
5. Replace 5-1 and 5-2
6. Replace A6-1 and CC A6-2, B6-1 and CC B6-2
7. Replace 12-1 thru 12-4, 12-19 thru 12-22
8. Replace 14-3 thru 14-10, 14-13 and 14-14, 14-17 thru 14-22
9. Replace section 15 (14 pages)
10. Replace 19-9 and 19-10
11. Replace 20-1 and 20-2

Prepared by:



Book Manager

Approved by:


Lead, EVA Systems Group


Lead, EVA Task Group

Accepted by:


Chief, EVA and Crew Systems
Operations Branch

Encl: 84 pages

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EVA CHECKLIST

GENERIC, REV H (Mar 4, 2005)

PCN-3 (Aug 1, 2005) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1633
EVA-1652**NOTE**

For STS-121 and subsequent flights


Incorporate the following:

1. Replace iii thru viii
2. Replace 15-1 thru 15-4

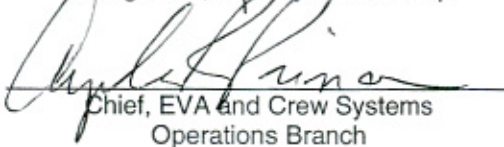
Prepared by:


Book Manager

Approved by:


Acting Lead, EVA Systems Group
Lead, EVA Task Group

Accepted by:


Chief, EVA and Crew Systems
Operations Branch

Encl: 10 pages

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EVA CHECKLIST

GENERIC, REV H (Mar 4, 2005)

PCN-2 (June 10, 2005) Sheet 1 of 1

List of Implemented Change Requests (482s):

EVA-1608

Incorporate the following:

1. Replace iii and iv
2. Replace 12-15 and 12-16

NOTE

For STS-114 and subsequent flights

Prepared by:

Pat S. Baber
Book Manager

Approved by:

Tricia K. Mack
Acting Lead, EVA Systems Group

Scott A. Bleisath for Randy McDaniel
Lead, EVA Task Group

Accepted by:

Angela R. Prince
Chief, EVA and Crew Systems
Operations Branch

Encl: 4 pages

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EVA CHECKLIST	GENERIC, REV H (Mar 4, 2005)
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PCN-1 (Apr 8, 2005) Sheet 1 of 1

List of Implemented Change Requests (482s):


- EVA-1563 EVA-1574 MULTI-1694
- EVA-1566 EVA-1575
- EVA-1570 (R) EVA-1576
- EVA-1573

(R) Remainder of a previous partial implementation is in this publication

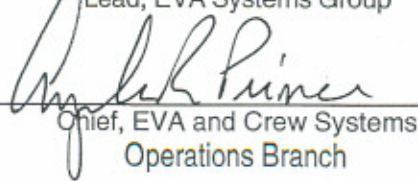
Incorporate the following:

1. Replace iii and iv
2. Replace 1-3 thru 1-10
3. Replace 2-1 and 2-2
4. Replace 4-5 thru 4-8
5. Replace 9-3 and 9-4
6. Replace 12-9 thru 12-14
7. Replace 15-3 and 15-4
8. Replace 19-5 and 19-6

Prepared by: 
 Book Manager

Approved by: 
 Lead, EVA Systems Group


 Lead, EVA Task Group

Accepted by: 
 Chief, EVA and Crew Systems
 Operations Branch

Encl: 28 pages

File this PCN immediately behind the front cover as a permanent record
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MISSION OPERATIONS DIRECTORATE

EVA CHECKLIST

GENERIC, REV H
March 4, 2005

PREPARED BY:



Paul G. Boehm
Book Manager

APPROVED BY:



Randall S. McDaniel
Lead, EVA Task Group



Randall S. McDaniel
Acting Lead, EVA Systems Group



Angela R. Prince
Chief, EVA and Crew Systems Operations Branch

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Incorporates the following:				
482#:	EVA-1529	EVA-1555	EVA-1564	MULTI-1693
	EVA-1530	EVA-1556	EVA-1565	MULTI-1694
	EVA-1543	EVA-1557	EVA-1566	
	EVA-1544A	EVA-1558	EVA-1567	
	EVA-1546	EVA-1559	EVA-1568	
	EVA-1551	EVA-1560	EVA-1569	
	EVA-1552	EVA-1561	EVA-1570(P)	
	EVA-1553	EVA-1562		
	EVA-1554	EVA-1563		

(P) – Partially implemented in this publication

AREAS OF TECHNICAL RESPONSIBILITY

Book Manager	DX35/P. Boehm	281-483-5447
Task Procedures	DX32/K. Shook	281-483-4474

EVA CHECKLIST

LIST OF EFFECTIVE PAGES

GENERIC	12/07/87	PCN-4	06/12/06	PCN-9	06/15/07
REV H	03/04/05	PCN-5	08/17/06		
PCN-1	04/08/05	PCN-6	11/10/06		
PCN-2	06/10/05	PCN-7	02/20/07		
PCN-3	08/01/05	PCN-8	05/22/07		

Sign Off	*	ALL/GEN H	4-11	ALL/GEN H,4
ii.....	*	ALL/GEN H	4-12	ALL/GEN H,4
iii.....	*	ALL/GEN H,9	5-1	ALL/GEN H
iv.....	*	ALL/GEN H,9	5-2	ALL/GEN H,4
v		ALL/GEN H,4	5-3	ALL/GEN H
vi.....		ALL/GEN H,9	5-4	ALL/GEN H
vii.....		ALL/GEN H,4	A6-1	NOM/GEN H
viii.....		ALL/GEN H,4	CC A6-2.....	NOM/GEN H,4
1-1		ALL/GEN H	B6-1	TNL/GEN H
1-2.....		ALL/GEN H	CC B6-2.....	TNL/GEN H,4
1-3.....		ALL/GEN H,9	6-3	ALL/GEN H
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2-3.....		ALL/GEN H	8-7	ALL/GEN H,9
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2-5.....		ALL/GEN H	9-1	ALL/GEN H
2-6.....		ALL/GEN H	9-2	ALL/GEN H,7
3-1		ALL/GEN H,4	9-3	ALL/GEN H,7
3-2.....		ALL/GEN H,7	9-4	ALL/GEN H,8
3-3.....		ALL/GEN H,5	9-5	ALL/GEN H,8
3-4.....		ALL/GEN H,6	9-6	ALL/GEN H
3-5.....		ALL/GEN H,6	10-1	ALL/GEN H,7
3-6.....		ALL/GEN H,6	10-2	ALL/GEN H
3-7.....		ALL/GEN H,7	10-3	ALL/GEN H
3-8.....		ALL/GEN H,7	10-4	ALL/GEN H
3-9.....		ALL/GEN H,7	10-4a	ALL/GEN H,7
CC 3-10.....		ALL/GEN H,4	10-4b	ALL/GEN H,7
CC 3-11.....		ALL/GEN H,4	10-5	ALL/GEN H
3-12.....		ALL/GEN H,4	10-6	ALL/GEN H
4-1		ALL/GEN H,4	10-7	ALL/GEN H
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4-4.....		ALL/GEN H	10-10	ALL/GEN H
4-5.....		ALL/GEN H,9	10-11	ALL/GEN H,7
4-6.....		ALL/GEN H,4	10-12	ALL/GEN H
4-7.....		ALL/GEN H,5	11-1	ALL/GEN H
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4-9.....		ALL/GEN H,7	11-3	ALL/GEN H,6
4-10.....		ALL/GEN H,4	11-4	ALL/GEN H

* – Omit from flight book

Δ – Replace with page from Flight Supplement, if applicable. Otherwise, not flown

12-i.....	ALL/GEN H	14-16	ALL/GEN H
12-ii	ALL/GEN H	14-17	ALL/GEN H
12-1	ALL/GEN H	14-18	ALL/GEN H,4
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12-3	ALL/GEN H	14-20	ALL/GEN H,4
12-4	ALL/GEN H,5	14-21	ALL/GEN H
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12-7	ALL/GEN H	15-2	ALL/GEN H,4
12-8	ALL/GEN H	15-3	ALL/GEN H,4
12-9	ALL/GEN H	15-4	ALL/GEN H,4
12-10.....	ALL/GEN H,1	15-5	ALL/GEN H,4
12-11.....	ALL/GEN H,1	15-6	ALL/GEN H,4
12-12.....	ALL/GEN H,1	15-7	ALL/GEN H,4
12-13.....	ALL/GEN H	15-8	ALL/GEN H,4
12-14.....	ALL/GEN H,1	15-9	ALL/GEN H,6
12-15.....	ALL/GEN H,2	15-10	ALL/GEN H,4
12-16.....	ALL/GEN H,2	15-11	ALL/GEN H,4
12-17.....	ALL/GEN H	15-12	ALL/GEN H,4
12-18.....	ALL/GEN H	15-13	ALL/GEN H,6
12-19.....	ALL/GEN H,4	15-14	ALL/GEN H,4
12-20.....	ALL/GEN H,4	16-i.....	ALL/GEN H
12-21.....	ALL/GEN H	16-ii.....	ALL/GEN H
12-22.....	ALL/GEN H,4	16-1	ALL/GEN H
12-23.....	ALL/GEN H	16-2	ALL/GEN H
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12-25.....	ALL/GEN H	17-2	△ ALL/GEN H
12-26.....	ALL/GEN H	18-1	△ ALL/GEN H
13-1	△ ALL/GEN H	18-2	△ ALL/GEN H
13-2	△ ALL/GEN H	19-i.....	ALL/GEN H
14-1	ALL/GEN H	19-ii.....	ALL/GEN H
14-2	ALL/GEN H	19-1	ALL/GEN H
14-3	ALL/GEN H	19-2	ALL/GEN H
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14-7	ALL/GEN H,4	19-6	ALL/GEN H,1
14-8	ALL/GEN H	19-7	ALL/GEN H
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14-14.....	ALL/GEN H,4	20-1	* ALL/GEN H
14-15.....	ALL/GEN H	20-2	* ALL/GEN H,4

EVA CUE CARDS

<u>Title</u>	<u>Ref. Page</u>	<u>Card No.</u>
SAFER CHECKOUT RESULTS (Front).....	CC 3-10	EVA-3a/O/C
SAFER STATUS TROUBLESHOOTING (Back)	CC 3-11	EVA-3b/O/D
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(Nominal Configuration) (Front).....	CC A6-2	EVA-1a/NOM/O/J
(Tunnel Adapter Configuration) (Front)	CC B6-2	EVA-2a/TNL/O/V
FAILED LEAK CHECK		
(Back of DEPRESS/REPRESS).....	CC 6-4	EVA-1b/O/J EVA-2b/O/J

△ – Replace with pages from Flight Supplement, if applicable. Otherwise, not flown

* – Omit from flight book

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MASK PREBREATHE INITIATE

1. Take one aspirin tablet (325 mg) if not taken previously
2. Configure quick don mask, HIU, and 14 ft comm/O2 umbilicals (two)
- C7
L2 3. √LEH O2 SPLY 1,2 vlv (two) – OP
4. O2 XOVR SYS 2 – CL
- C6,
MO32M,
MO69M 5. LEH O2 4(5,6,7) outlet – connect O2 hose
- MO39M 6. MIDDECK COMM CCU PWR – OFF
outlet – connect comm cable
CCU PWR – ON
7. Decrease HIU volume control
- C6,
MO32M,
MO69M 8. LEH O2 4(5,6,7) vlv – OP

WARNING

Positive mask O2 pressure and fit are necessary to ensure adequate prebreathe

9. Verify black plates in top of mask are seated in silicon
10. Don mask
11. Set mask O2 control to EMERGENCY
12. Momentarily pull mask away from face and verify O2 flow
* If no positive O2 flow, contact MCC *
13. √Comm
14. Configure ATU for PTT/PTT as reqd to alleviate comm noise

WARNING

Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr prebreathe completed

15. Note time and continue mask prebreathe at least 1 hr

**PREP FOR 10.2 PSI CABIN
PRESS/CRYO SYS CONFIG**

- L2 1. √O2 SYS 1,2 SPLY (two) – ctr (tb-OP)
 √XOVR SYS 1 – OP
 2 – CL
2. √N2 SYS 1,2 SPLY (two) – ctr (tb-OP)
 √REG INLET (two) – ctr (tb-OP)
3. O2/N2 CNTLR VLV SYS 1 – OP (N2)
 2 – CL (O2)
- SM 88 APU/ENVIRON THERM**
- L1 4. If FLASH EVAP CNTLR PRI A,B – OFF:
 If FREON LOOP 1,2 EVAP OUT T between
 41-47 degF:
 RAD CNTLR OUT TEMP – HI
 When FREON EVAP OUT TEMP > 50 degF,
 RAD CNTLR OUT TEMP – NORM (then
 immediately)
 FLASH EVAP CNTLR PRI A(B) – ON
 After ~1 min
 √FREON EVAP OUT TEMP ~39 degF
 If FREON LOOP 1,2 EVAP OUT T not between
 41-47 degF:
 FLASH EVAP CNTLR PRI A(B) – ON
- L1 If FLASH EVAP CNTLR PRI A(B) – ON, continue:

AIRLOCK/MIDDECK PREP

- MO10W 5. O2 REG INLET SYS 1 vlv – CL
 2 vlv – OP
6. √N2 XOVR vlv – CL
- AW18A 7. LTG FLOOD (four) – ON
- DCM 8. √PURGE vlv – op (up)
9. Remove LTA Restraint Bag (1 ea EMU)
- AW82B 10. AIRLK DEPRESS vlv cap – vent, remove

RESET FDA & C/W LIMITS

X: SM 60 SM TABLE MAINT

11. Contact MCC for uplink of B/U C/W and SM ALERT
 TMBU (if desired)
 Changes enclosed in

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV103)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV104)	4	2.50	3.85	ENA	0612405	10.0	15.2
(OV105)	4	2.45	3.80	ENA	0612405	10.0	15.2
O2 FLOW 1	14		4.90	INH	0612105		4.9
2	24		4.90	INH	0612205		4.9
PPO2 A	34	2.55	3.60	ENA	0612511	2.55	3.6
B	44	2.55	3.60	ENA	0612513	2.55	3.6
N2 FLOW 1	54		4.90	INH	0612553		4.9
2	64		4.90	INH	0612554		4.9
FAN ΔP	74	1.75	4.25	ENA	0612556	2.8	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
OV-103				
AV BAY 1 FAN ΔP	ENA	0612642	2.29	4.90
AV BAY 2 FAN ΔP	ENA	0612647	1.91	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.21	5.10
OV-104				
AV BAY 1 FAN ΔP	ENA	0612642	1.91	4.50
AV BAY 2 FAN ΔP	ENA	0612647	1.91	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.21	5.10
OV-105				
AV BAY 1 FAN ΔP	ENA	0612642	2.04	4.90
AV BAY 2 FAN ΔP	ENA	0612647	1.70	4.50
AV BAY 3 FAN ΔP	ENA	0612658	1.97	5.10
IMU FAN ΔP	ENA	0612869	2.7	4.95
CABIN O2 CONCENTRATION	ENA	0922104		28.5
AIRLK P	INH	0640101	13.8	15.7
EXT AIRLK P	INH	0640126	13.8	15.7

CABIN DEPRESS TO 10.2 PSI

WARNING

Do not initiate depress until EV1 and EV2 have completed 45 min of mask prebreathe

Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr mask prebreathe completed

EV

1. Momentarily pull mask away from face and verify O2 flow
 - * If no positive O2 flow, contact MCC *
2. Plot initial CABIN P vs PPO2 on 10.2 PSIA DEPRESS CHART using SM SYS SUMM 1

WARNING

Cabin O2 concentration (SM SYS SUMM 1) must be maintained below 28.5% to protect against increased flammability risk

Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

NOTE

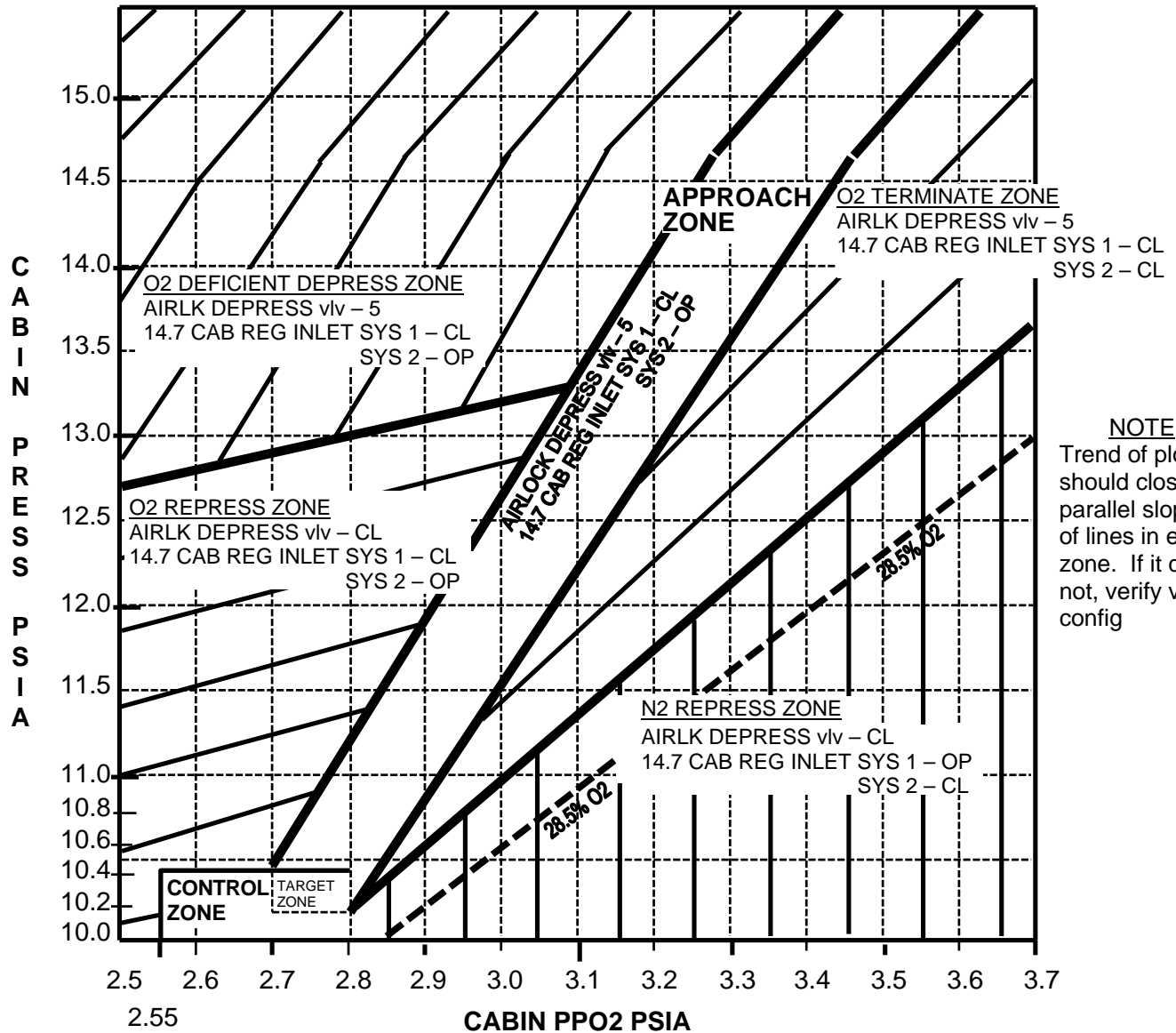
Expect klaxon each time airlock depress valve opened

AW82B, 3. START DEPRESS

MO10W Config vlvs per DEPRESS CHART

4. Continue plotting CABIN P vs PPO2 every 60 sec using SM SYS SUMM 1. Reconfig vlvs when plot transitions into different zone
5. STOP DEPRESS
When CABIN P and PPO2 are in CONTROL ZONE (TARGET ZONE preferred), stop depress by configuring as listed at lower left of 10.2 PSIA DEPRESS CHART

10.2 PSIA DEPRESS CHART



NOTE
Trend of plot should closely parallel slope of lines in each zone. If it does not, verify valve config

When in **CONTROL ZONE**
(**TARGET ZONE** preferred):
STOP DEPRESS
AIRLK DEPRESS vlv - CL
Install AIRLK DEPRESS vlv Cap
14.7 CAB REG INLET SYS 1 - CL
SYS 2 - CL

10.2 PSI CABIN CONFIG

X: SM 60 SM TABLE MAINT

- R13
1. Reset FDA & C/W limits
Changes enclosed in
 2. Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV103) (OV104) (OV105)	4	2.50	2.70	ENA	0612405	10.0	10.6
	4	2.50	2.70	ENA	0612405	10.0	10.6
	4	2.45	2.65	ENA	0612405	10.0	10.6
PPO2 A B	34	2.55	2.90	ENA	0612511	2.55	2.9
	44	2.55	2.90	ENA	0612513	2.55	2.9
FAN ΔP	74	1.75	3.05	ENA	0612556	2.8	4.88

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
OV-103				
AV BAY 1 FAN ΔP	ENA	0612642	2.29	3.82
AV BAY 2 FAN ΔP	ENA	0612647	1.91	3.51
AV BAY 3 FAN ΔP	ENA	0612658	2.21	3.98
OV-104				
AV BAY 1 FAN ΔP	ENA	0612642	1.91	3.51
AV BAY 2 FAN ΔP	ENA	0612647	1.91	3.51
AV BAY 3 FAN ΔP	ENA	0612658	2.21	3.98
OV-105				
AV BAY 1 FAN ΔP	ENA	0612642	2.04	3.33
AV BAY 2 FAN ΔP	ENA	0612647	1.70	3.06
AV BAY 3 FAN ΔP	ENA	0612658	1.97	3.47
IMU FAN ΔP	ENA	0612869	2.7	3.8

3. Perform SM CHECKPOINT INITIATE (ORB OPS, DPS)

L2 4. O2 XOVR SYS 2 – OP

5. If O2 bleed orifice not installed:

MO69M ✓LEH O2 vlv 8 – CL
Unstow and insert O2 bleed orifice in O2 QD
LEH O2 vlv 8 – OP

MASK PREBREATHE TERMINATE

WARNING

Do not terminate prebreathe until cabin pressure at 10.2 psia and 1 hr prebreathe completed

When mask prebreathe complete:

- EV
1. Momentarily pull mask away from face to verify O2 flow

* If no positive O2 flow, contact MCC *

2. Set mask O2 control to NORMAL
3. Doff mask

C6,
MO32M,
MO69M

4. LEH O2 4(5,6,7) vlv – CL

MO39M

5. MIDDECK COMM CCU PWR – OFF
outlet – Disconnect
comm cable
CCU PWR – ON

6. Depress Mask O2 control

C6,
MO32M,
MO69M

7. LEH O2 4(5,6,7) outlet – Disconnect hose

8. Stow mask, HIU, and 14 ft comm/O2 umbilical

10.2 PSI MAINTENANCE

WARNING

Cabin O2 concentration (SM SYS SUMM 1) must be maintained below 28.5%. See chart this page

Terminate all WCS activity while flowing N2 thru 14.7 CAB REG INLET SYS 1

CAUTION

Do not perform 10.2 PSI MAINTENANCE in parallel with EMU purge

X: SM SYS SUMM 1

NOTE

Perform 10.2 PSI MAINTENANCE procedure post airlock repress and post sleep while 10.2 psi operations desired. Perform pre-sleep maintenance, if reqd, using target area in control zone

1. If PPO2 < 2.70 psia:
If pre-sleep:
OCAC Perform OCAC filter cleaning as reqd
OCAC PWR – OFF
C5 DIRECT O2 – OP
2. When PPO2 ~2.70 psia or when CABIN PRESS ~10.4 psia:
DIRECT O2 – CL
If pre-sleep:
OCAC PWR – ON
3. If CABIN PRESS < 10.40 psia:
MO10W 14.7 CAB REG INLET SYS 1 vlv – OP (N2)
When CABIN PRESS ~10.40 psia:
14.7 CAB REG INLET SYS 1 vlv – CL

CABIN LEAK MONITORING

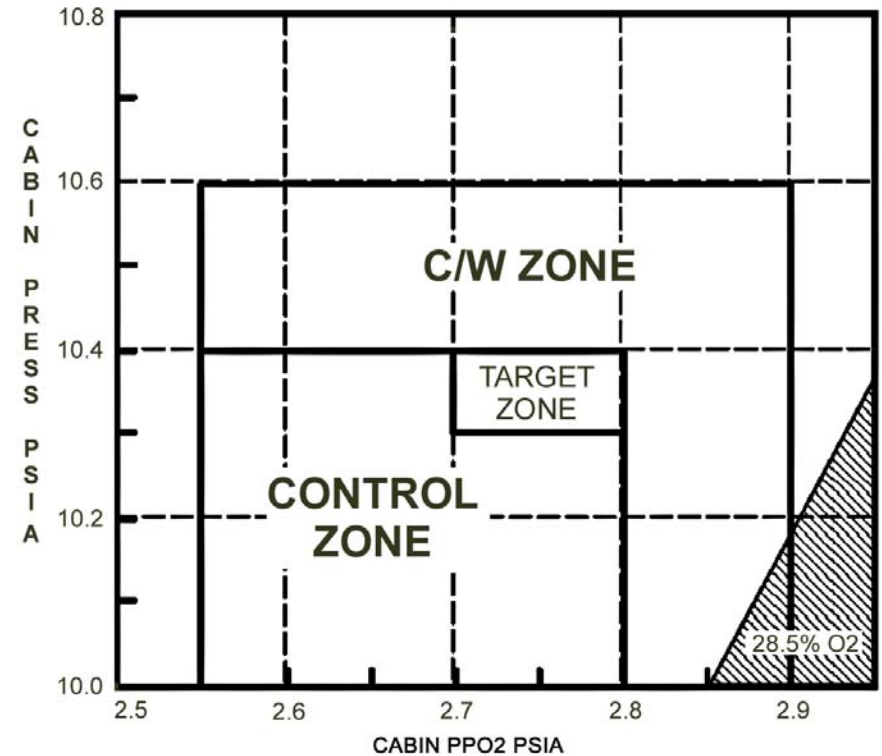
4. Log 10.2 PSI MAINTENANCE times (MET)

1. _____	5. _____
2. _____	6. _____
3. _____	7. _____
4. _____	8. _____

NOTE

If MCC requests maintenance, then log time and use that time to compare to next maintenance

5. If successive maintenance reqd because CABIN PRESS decreased from 10.40 to 10.00 psia:
For $\Delta t < 40$ min, go to O2(N2) FLOW HIGH/CAB P LOW/dP/dT (ORB PKT, ECLS)
For $40 \text{ min} < \Delta t < 10 \text{ hr}$, go to MAL, ECLS SSR-8, SMALL CABIN-LEAK ISOL



CABIN REPRESS TO 14.7 PSI

WARNING
 Terminate all WCS activity during repress
 to 14.7 psia

SETUP

X: SM 60 SM TABLE MAINT

- R13
1. Reset C/W and FDA limits
 2. Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)
- Changes enclosed in

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV103) (OV104) (OV105)	4	2.50	3.85	ENA	0612405	10.0	15.2
	4	2.50	3.85	ENA	0612405	10.0	15.2
	4	2.45	3.80	ENA	0612405	10.0	15.2
PPO2 A B	34	2.55	3.60	ENA	0612511	2.55	3.6
	44	2.55	3.60	ENA	0612513	2.55	3.6
FAN ΔP	74	1.75	4.25	ENA	0612556	2.8	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
OV-103				
AV BAY 1 FAN ΔP	ENA	0612642	2.29	4.90
AV BAY 2 FAN ΔP	ENA	0612647	1.91	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.21	5.10
OV-104				
AV BAY 1 FAN ΔP	ENA	0612642	1.91	4.50
AV BAY 2 FAN ΔP	ENA	0612647	1.91	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.21	5.10
OV-105				
AV BAY 1 FAN ΔP	ENA	0612642	2.04	4.90
AV BAY 2 FAN ΔP	ENA	0612647	1.70	4.50
AV BAY 3 FAN ΔP	ENA	0612658	1.97	5.10
IMU FAN ΔP	ENA	0612869	2.7	4.95
H2O LOOP ICH OUT T1 T2	ENA	0612744	33.0	
	ENA	0612724	33.0	

REPRESS

X: SM 66 ENVIRONMENT

- MO10W
3. 14.7 CAB REG INLET SYS 1,2 vlv (two) – OP
- L2
4. √O2/N2 CNTLR VLV SYS 1 – OP
2 – AUTO
 5. Contact MCC to determine if FES should remain ON
 6. If FES operation not reqd:
- L1
- FLASH EVAP CNTLR PRI A(B) – OFF

14.7 PSI CABIN CONFIG

ORBITER PCS 1(2) CONFIG

- MO10W
- O2 REG INLET SYS 1(2) vlv – OP
2(1) vlv – CL
 - H2O TK N2 REG INLET SYS 1(2) vlv – OP
2(1) vlv – CL
 - H2O TK N2 ISOL SYS 1,2 vlv (two) – OP
 - If prior to shuttle airlock repress:
14.7 CAB REG INLET SYS 1,2 vlv (two) – CL
If after shuttle airlock repress:
14.7 CAB REG INLET SYS 1(2) vlv – OP
2(1) vlv – CL
- L2
- O2/N2 CNTLR VLV SYS 1(2) – AUTO
2(1) – CL(O2)

RESET C/W AND FDA LIMITS

- R13U
- Contact MCC for uplink of B/U C/W and SM ALERT TMBU (if desired)
Changes enclosed in

PARAMETER NAME	C/W CHL	H/W C/W		H/W & B/U ENA/INH	PARA ID	B/U C/W	
		LO V	HI V			LO EU	HI EU
CABIN PRESS (OV103)	4	3.45	3.85	ENA	0612405	13.8	15.2
(OV104)	4	3.45	3.85	ENA	0612405	13.8	15.2
(OV105)	4	3.40	3.80	ENA	0612405	13.8	15.2
O2 FLOW 1	14		4.90	ENA	0612105		4.9
2	24		4.90	ENA	0612205		4.9
PPO2 A	34	2.7	3.60	ENA	0612511	2.7	3.6
B	44	2.7	3.60	ENA	0612513	2.7	3.6
N2 FLOW 1	54		4.90	ENA	0612553		4.9
2	64		4.90	ENA	0612554		4.9
FAN ΔP	74	2.60	4.25	ENA	0612556	4.2	6.8

PARAMETER NAME	ENA/INH	PARA ID	SM ALERT	
			LOW	HIGH
OV-103				
AV BAY 1 FAN ΔP	ENA	0612642	3.00	4.90
AV BAY 2 FAN ΔP	ENA	0612647	2.50	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.90	5.10
OV-104				
AV BAY 1 FAN ΔP	ENA	0612642	2.50	4.50
AV BAY 2 FAN ΔP	ENA	0612647	2.50	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.90	5.10
OV-105				
AV BAY 1 FAN ΔP	ENA	0612642	3.00	4.90
AV BAY 2 FAN ΔP	ENA	0612647	2.50	4.50
AV BAY 3 FAN ΔP	ENA	0612658	2.90	5.10
IMU FAN ΔP	ENA	0612869	3.7	4.95
CABIN O2 CONCENTRATION	ENA	0922104		25.9
AIRLK P	ENA	0640101	13.8	15.7
EXT AIRLK P	ENA	0640126	13.8	15.7
H2O LOOP ICH OUT T1	ENA	0612744	35.0	
T2	ENA	0612724	35.0	

- Go to SM CHECKPOINT INITIATE (ORB OPS, DPS)

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AIRLOCK CONFIG

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EMU REMOVAL	2-4
INSTALLATION	2-4
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LTA RESTRAINT STRAP REMOVAL	2-6
INSTALLATION	2-6

AIRLOCK
CONFIG

AIRLOCK PREP (50 min)

	Retrieve or unstow following equipment:
MF28G	3/8-in breaker bar, 4-in ext w/3/8-in drive
IFM Tool Kit	1/2-in socket w/3/8-in drive
Vol H	EMU Equipment Bag – attach to middeck wall
	Helmet Lights
	EVA Bag
	Contamination Detection Kit (location flight specific)
<u>FDF Locker</u>	Cuff Checklists (2) – stow in EMU Equipment Bag
	<u>DEPRESS/REPRESS</u> Cue Card

- AW18A
1. ✓ Inner hatch Equal vlv (two) – OFF
 2. LTG FLOOD (four) – ON
 3. Remove from airlock, as reqd:
 - Airlock Stowage Bag
 - Airlock Floor Pallet using 3/8-in breaker bar, 4-in ext w/3/8-in drive, and 1/2-in socket w/3/8-in drive
 4. Stow Vol H Bags in Vol H
 5. Transfer to airlock:
 - EVA Bag – install on airlock wall
 - DEPRESS/REPRESS Cue Card
 - Helmet Lights
 - Contamination Detection Kit – install on airlock wall
 6. Install IVA foot restraint, as reqd
 7. Unbuckle SCU straps, Velcro SCU to wall
 8. Install EMU lights on helmets (EMU 1, EMU 2)
 9. Disconnect helmets from Airlock EMUs, temp stow
 10. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses
 11. Install helmets (not reqd if proceeding directly to EMU Checkout)
 12. Remove LTA Restraint Bags
 13. Disconnect waist rings; remove and stow any equipment stowed in HUT/LTA
 14. Stow LTA Restraint Bags on AAPs
 15. ✓ Thermal cover clear of waist ring
 16. Waist ring – engage posn
 17. Connect LTA to HUT, lock
 18. Remove 20-g Crash Bag from middeck EMU, as reqd

AIRLOCK
CONFIG

EMU SWAP (30 min)

NOTE

EMU X is to be removed and EMU Y is to be installed

- | | | |
|-------|--|--|
| EMU X | 1. Install gloves | |
| AW18H | 2. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF | |
| | √MODE (two) – OFF | |
| DCM | 3. Disconnect SCU, install DCM cover | |
| | 4. Stow SCU on AAP, Velcro to wall | |
| | 5. Connect LTA to HUT, lock (if reqd) | |
| | 6. Disconnect helmet with sunshades down and helmet cover installed; stow | |
| | 7. Release EMU from AAP, transfer EMU to middeck | |
| | 8. Install helmet | |
| | 9. Remove 20-g Crash Bag on middeck EMUs (if flown) | |
| EMU Y | 10. Disconnect helmet, temp stow | |
| | 11. Remove comm cap from LTA Restraint Bag and connect to electrical harness (if reqd) | |
| | 12. Remove LTA Restraint Bag | |
| | 13. Release EMU from middeck AAP, transfer to airlock | |
| | 14. Mount EMU on AAP | |
| | 15. Install helmets (not reqd if proceeding directly to EMU Checkout) | |
| | 16. Disconnect waist ring; remove and stow any equipment stowed in HUT/LTA | |
| | 17. Waist ring – engage posn | |
| | 18. Connect LTA to HUT, lock | |

NOTE

O2 vlv for SCU connected to EMU Y must be closed prior to checkout of EMU Y

- | | | |
|-------|--|--|
| AW82B | 19. If performing EMU CHECKOUT of EMU Y:
EV-1(EV-2) O2 vlv – CL | |
| EMU X | 20. Attach EMU to middeck AAP | |
| | 21. Attach LTA Restraint Bag | |

BOOSTER FAN DEACTIVATION/REMOVAL (15 min)

- MO13Q 1. ARLK FAN A,B (two) – OFF
MA73C:G 2. cb AC1,2 ARLK TNL FAN A,B (six) – op
EXT A/L 3. Disconnect flex duct from booster fan muffler inlet, direct airflow into airlock, temp secure
4. Disconnect vent duct from booster fan outlet and external airlock duct inlet; temp stow in middeck
If booster fan to be removed:
5. Disconnect flex duct from booster fan inlet; rotate and stow in launch bracket
6. Demate booster fan electrical connectors from J1,J2 (two) on tunnel extension wall; loosen cable harnesses (two) from Velcro strips (four)
7. Stow electrical connectors (two) on booster fan dummy fittings, secure cable harnesses with Velcro strips
8. Loosen booster fan fasteners (four)
9. Remove booster fan assy, temp stow in middeck

BOOSTER FAN INSTALLATION/ACTIVATION (15 min)

- If booster fan to be installed:
MA73C:G 1. √cb AC1,2 ARLK TNL FAN A,B (six) – op
MO13Q 2. √ARLK FAN A,B (two) – OFF
EXT A/L 3. Install booster fan assy, secure fasteners (four)
4. Demate electrical connectors (two) from booster fan dummy fittings and Velcro strips
5. Mate booster fan electrical connectors J1,J2 (two) on tunnel extension wall; secure cable harnesses (two) with Velcro strips (four)
6. Unstow/connect flex duct from launch bracket to booster fan inlet
7. Unstow/connect vent duct to external airlock duct inlet and booster fan outlet
8. Unstow/connect flex duct from middeck to fan muffler inlet
MA73C:G 9. cb AC1,2 ARLK TNL FAN A,B (six) – cl
MO13Q 10. ARLK FAN A(B) – ON
11. Check for airflow at top of external airlock halo

EMU REMOVAL (15 min)

1. As reqd, install gloves
2. As reqd, perform LTA RESTRAINT STRAP INSTALLATION (AIRLOCK CONFIG)
3. As reqd, relocate LTA spring hooks (four) from AAP rings to SAFER mount brackets
4. Disconnect EMUs from AAPs, stow in middeck

EMU INSTALLATION (15 min)

1. Transfer EMUs to A/L, connect to AAPs
2. As reqd for EVA, perform LTA RESTRAINT STRAP REMOVAL (AIRLOCK CONFIG)
3. As reqd, relocate LTA spring hooks (four) from SAFER mount brackets to AAP rings

EMU CHECKOUT PREP (30 min)

- AW18A 1. LTG FLOOD (four) – ON
- 2. Remove Airlock Stowage Bag from airlock (if flown)
- Vol H 3. Unstow:
 - EMU Equipment Bag – attach to middeck wall |
 - EMU Servicing Kit – mark with Gray Tape; label “Shuttle”; temp stow
 - Drink Bags for later use (stow on top of Vol H Bags)
- 4. Stow Vol H Bags in Vol H
- 5. Unbuckle SCU straps, Velcro SCU to wall
- 6. Remove 20-g Crash Bag from middeck EMU (if flown)
- 7. Disconnect helmets from airlock EMUs, temp stow |
- 8. Remove comm caps from LTA Restraint Bags and connect to electrical harnesses in EMU
- 9. Remove LTA Restraint Bags
- 10. Disconnect waist rings; remove and temp stow any equipment stowed in HUT/LTA
- 11. Stow LTA Restraint Bags on AAP
- 12. ✓ Thermal cover clear of waist rings
- 13. Waist ring – engage position
- 14. Connect LTA to HUT, lock
- 15. Install helmet with sunshades down and helmet cover installed; lock (not reqd | if proceeding directly to EMU Checkout)

LTA RESTRAINT STRAP REMOVAL (15 min)

NOTE

May be performed on EMU 1 and 2 simultaneously.
Perform steps as reqd for current EMU config

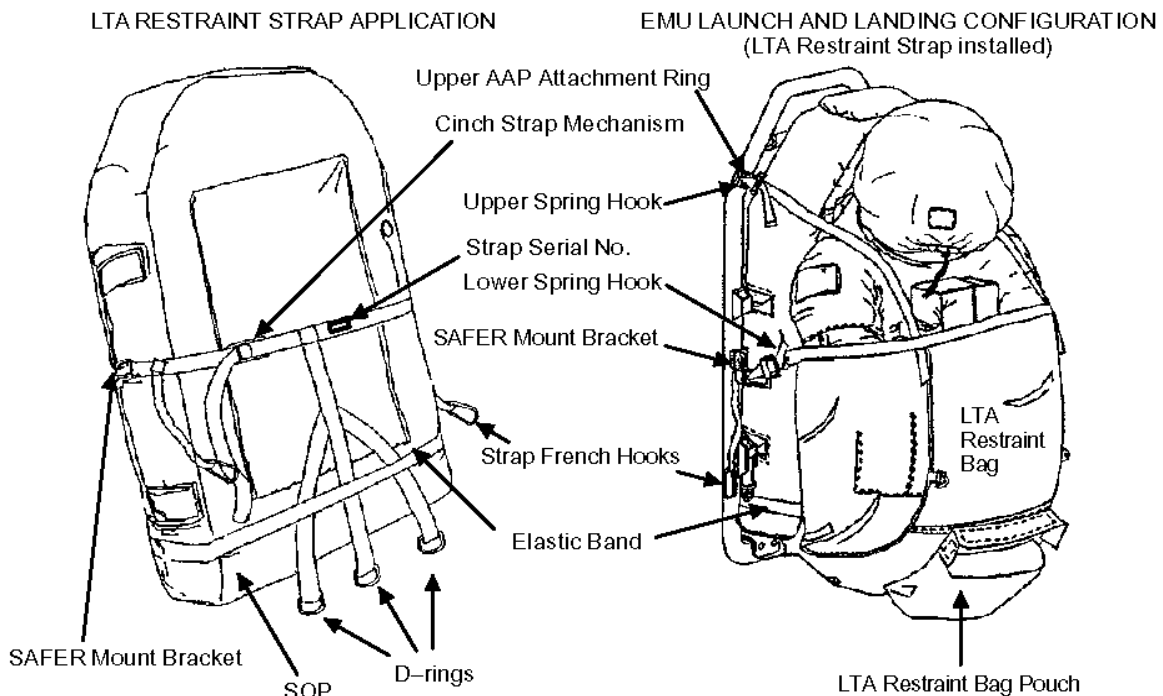
1. As reqd, remove comm cap from LTA Restraint Bag; temp stow
2. Remove EMU from AAP
3. Disconnect all restraint attachments from SAFER mount brackets (two)
4. Loosen cinch strap mechanism, remove SAFER mount brackets
5. Remove strap from PLSS
6. Stow strap in LTA Restraint Bag Pouch with D-rings (three) connected
7. Engage EMU in AAP
8. Stow LTA Restraint Bag/strap

LTA RESTRAINT STRAP INSTALLATION (15 min)

NOTE

May be performed on EMU 1 and 2 simultaneously. Perform steps as reqd for current EMU config. Procedure written to install in Launch/Landing config shown below

1. Unstow LTA Restraint Bag/strap
2. Remove EMU from AAP
3. Install SAFER mount brackets (two)
4. Install elastic band of strap around SOP
5. Tighten cinch strap mechanism
6. Attach strap French hooks (two) to SAFER mount brackets
7. Engage EMU in AAP
8. Stow LTA, suit arms inside LTA Restraint Bag
9. Connect upper spring hooks (two) over suit shoulders to upper AAP attachment rings (two)
10. Connect lower spring hooks (two) around suit arms to SAFER mount brackets (two)
11. Tighten all LTA bag straps with bag as high as possible on EMU



NOTE

French hooks should be attached to SAFER mount brackets for launch and landing

CHECKOUTS

EMU CHECKOUT	3-2
EMU POWERUP AND COMM CHECK	3-2
PRIMARY REGULATOR/FAN/PUMP CHECK	3-4
SOP CHECK	3-5
BATTERY CHARGE CHECK INIT	3-6
BATTERY CHARGE CHECK TERM.....	3-6
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SAFER CHECKOUT RESULTS	CC 3-10
SAFER STATUS TROUBLESHOOTING.....	CC 3-11
REBA POWERED HARDWARE CHECKOUT	3-12

CHECKOUTS

EMU CHECKOUT

NOTE

Procedures are written for simultaneous C/O of EMUs #_____ (stbd) and #_____ (port) in airlock. An additional C/O of EMU(s) #_____ uses same procedure after performing EMU SWAP during C/O

X: SM 60 SM TABLE MAINT

1. Contact MCC for uplink of SM ALERT TMBU (if desired)
Changes enclosed in

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	100
EXT A/L LCG 2 SPLY ZN 1 T	0640182	36	85
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	100
EXT A/L LCG 2 SPLY ZN 2 T	0640185	36	82
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	80
EXT A/L BATT CHARGER			
VOLTS EMU 1	0640210	OSL	OSH
VOLTS EMU 2	0640213	OSL	OSH

EMU POWERUP AND COMM CHECK (15 min)

NOTE

If procedure is being repeated for 3rd EMU #_____ only, other previously checked EMU #_____ is reqd in airlock to perform EMU POWERUP and COMM CHECK procedures to verify EMU-to-EMU comm.

PWR RESTART msg and BITE light should be illuminated whenever EMU power is cycled. Display and tone tests only occur during cold restarts

- BOTH DCM 2. Retrieve, position SCUs; remove DCM covers
 3. Connect SCUs to DCM, \checkmark locked
 4. PWR – BATT

CAUTION

EMU must be on BATT pwr when airlock power supply is turned on

- AW18H 5. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
 BUS SEL (two) – MNA(MNB)
 6. \checkmark EMU INPUT 1,2 volts = 18.0-20.0
 EV AW18D 7. \checkmark AIRLK AUD PWR – OFF
 BOTH DCM 8. COMM mode – ALT
 9. \checkmark Comm FREQ – LOW
 IV A1R 10. \checkmark AUD CTR UHF A/G 1,2 (two) – OFF
 A/A – T/R
 R14:C 11. \checkmark cb MNA UHF EVA – cl
 \checkmark MNC UHF EVA – cl

CHECKOUTS

- R10 12. BIOMED CH 1 – EVA 1
 CH 2 – EVA 2
- IVA ATU 13. \sqrt AUD PWR – AUD/TONE
 A/G 1,2 (two) – OFF
 A/A – T/R
 ICOM A,B (two) – OFF (as reqd)
- O6 14. \sqrt UHF SPLX/EVA PWR AMP – OFF
 MODE – EVA
- BOTH 15. \sqrt Helmets disconnected
 16. Don comm caps

NOTE

After the next step, be prepared to verify no missing segments on display and that all tones are audible

17. PWR – SCU
18. Verify no missing segments during display test
 Verify BITE light extinguishes
 Verify status (continuous) tone and warble tone are audible

Report any anomalies to MCC

19. Perform onboard A/A comm check per table

EMUs		IV O6:	
MODE	FREQ	EVA STRING	UHF SPLX/EVA XMIT FREQ
ALT	LOW	2	259.7/414.2
ALT	HIGH	2	296.8/417.1
PRI	HIGH	1	296.8/417.1
PRI	LOW	1	259.7/414.2

- IV IVA ATU 20. AUD A/G 1(2) – T/R
- A1R 21. AUD CTR UHF A/G 1(2) – T/R
 \sqrt A/G 2(1) – OFF
 A/A – OFF
- BOTH 22. Verify RF comm with MCC
- IV A1R 23. AUD CTR UHF A/G 1(2) – OFF
 24. Doff comm caps

 If procedure is being repeated for 3rd EMU # _____ only, then on other
 previously checked EMU # _____:
 25. Install helmet, lock
 26. COMM mode – OFF
 27. PWR/BATT CHGR EMU 1(2) BUS SEL – OFF
 MODE – OFF

- DCM 28. DISP – STATUS, until DATA?COMBO displayed
 – YES (hold for 2 sec)
 – STATUS, until DATA EMU? displayed
 – YES (hold for 2 sec)
 Verify DATA?EMU displayed

PRIMARY REGULATOR/FAN/PUMP CHECK (40 min)

- MD(fir) 29. EMU O2 ISOL VLV – OP
 DCM 30. √STATUS: O2 P = 850-950

EMU	1	2	3	4
30. O2 P				

- AW82B 31. EV-1, EV-2 O2 vlv (two) – OP
 32. Install helmet, lock
 33. √Suit arms aligned
 34. √Gloves locked
 DCM 35. √Helmet purge vlv – cl, locked
 36. PURGE vlv – cl (dn)
 37. O2 ACT – IV
 38. √STATUS: SUIT P = 0.4-1.4 and stable (compare w/gauge)

EMU	1	2	3	4
38. SUIT P (IV)				

39. O2 ACT – PRESS
 40. √STATUS: SUIT P = 4.2-4.4 and stable (compare w/gauge)
 H2O TEMP = ambient
 H2O GP = 14.0-16.0
 H2O WP = 14.0-16.0

EMU	1	2	3	4
40. SUIT P (PRESS)				
H2O TEMP				
H2O GP				
H2O WP				

41. DISP – STATUS, until LEAK CHECK? displayed
 DISP – YES (hold for 2 sec)
 Follow displayed instructions

EMU	1	2	3	4
41. ΔP				

- * If LEAKAGE HI/ SUIT P msg occurs ($\Delta P > 0.3$ psi), *
 * go to FAILED LEAK CHECK (14.7/10.2 PSI) Cue *
 * Card, CC 6-4 *

- DCM 42. O2 ACT – OFF
 43. PURGE vlv – op (up)
 44. √STATUS: SUIT P < 0.4 (compare w/gauge)
 45. Disconnect glove
 46. Reconnect glove
 47. Disconnect helmet, temp stow
 48. Disconnect waist ring – secure LTA to outer hatch handrail
 49. Remove Multiple Water Connector cover, temp stow
 DCM 50. Connect LCVG, √locked
 51. √Temp control vlv – Max C

CAUTION
Minimize fan operation with O2 ACT – OFF (~2 min)

52. FAN – ON (PWR RESTART may occur)
Verify flow at neck ring vent port
- AW18H 53. $\sqrt{\text{EMU INPUT amps}} = 1.5\text{-}4.7$ (1.5-5.0 at 14.7)

EMU	1	2	3	4
53. INPUT AMPS				

- DCM 54. Install SCOF, lock
55. O2 ACT – IV, **NO VENT FLOW** msg, DISP – PRO
 $\sqrt{\text{Cooling flow in LCVG}}$
56. $\sqrt{\text{STATUS: H2O TEMP}}$ decrease from step 40

EMU	1	2	3	4
56. H2O TEMP				

- * If no temp decrease, depress and hold pump priming *
* valve on back of EMU, while slowly cycling TCV *
* between 7 and Max C (30 sec minimum) *

- AW18H 57. $\sqrt{\text{EMU INPUT amps}} = 1.5\text{-}3.6$ (1.5-4.0 at 14.7)
 $\sqrt{\text{EMU INPUT amps decrease from step 53}}$

EMU	1	2	3	4
57. INPUT AMPS				

- DCM 58. PWR – BATT, **NO VENT FLOW** message, DISP – PRO
59. $\sqrt{\text{STATUS: BAT VDC}} \geq 16.5$
 $\sqrt{\text{BAT AMPS}} = 2.3\text{-}3.7$ (2.4-4.0 at 14.7)
 $\sqrt{\text{RPM}} = 18.0\text{-}20.0$ K

EMU	1	2	3	4
59. BAT VDC				
BAT AMPS				
RPM				

60. $\sqrt{\text{Fan noise steady}}$
61. O2 ACT – OFF
62. FAN – OFF
63. PWR – SCU

SOP CHECK (5 min)

64. Perform step 28 to reset data to EMU mode

- DCM 65. $\sqrt{\text{STATUS: SOP P}} = 5410\text{-}6800$

EMU	1	2	3	4
65. SOP P				

SOP 66. √SOP gauge 5400-6800, note SOP interstage gauge

EMU	1	2	3	4
66. SOP GAUGE				
INT GAUGE				

DCM 67. DISP – STATUS until **SUIT P** displayed
– YES (hold for 2 sec) to lock parameter

68. Depress SOP manual override (50 sec max):
√SOP interstage gauge < 600
DCM √STATUS: **SUIT P** = 3.4-3.9

EMU	1	2	3	4
68. SUIT P				
INT GAUGE				

69. √STATUS: **SOP P** = 5410-6800

EMU	1	2	3	4
69. SOP P				

- 70. Remove SCOF, stow
- 71. Disconnect LCVG, stow (as reqd if transferring to ISS)
- 72. Install Multiple Water Connector cover
- 73. Install helmet, LTA
- DCM 74. COMM mode – OFF

BATTERY CHARGE CHECK INIT (15 min)

AW18H 75. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – CHARGE
BUS SEL (two) – MNA(MNB)

76. Continue charge 15 min, minimum

BATTERY CHARGE CHECK TERM

When PWR/BATT CHGR EMU INPUT AMPS < 1 and 15 min minimum charge complete:

77. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF

Cont next page

EMU SWAP DURING CHECKOUT (30 min) (If reqd)

NOTE

EMU(s) # _____ to be removed from airlock.
 EMU(s) # _____ to be installed in airlock.
 Procedure written for swap of one or two EMUs

- EMU _____ 78. √Gloves installed
- DCM _____ 79. Disconnect SCU, install DCM cover
- _____ 80. Stow SCU on AAP, Velcro to wall
- _____ 81. Release EMU from AAP, transfer EMU to middeck
- EMU _____ 82. Disconnect helmet, stow
- _____ 83. Remove comm cap from LTA Restraint Bag and connect to electrical harness
- _____ 84. Remove LTA Restraint Bag
- _____ 85. Release EMU from middeck AAP, transfer to airlock
- _____ 86. Install EMU on AAP
- _____ 87. Disconnect waist ring; remove and stow any equipment stowed in HUT/LTA
- _____ 88. Waist ring – engage posn
- _____ 89. Connect LTA to HUT, lock

NOTE

O2 vlv for SCU connected to EMU(s) # _____
 must be closed prior to checkout of EMU

- AW82B _____ 90. EV-_____ O2 vlv – CL
- EMU _____ 91. Install EMU on middeck AAP
- _____ 92. Attach LTA Restraint Bag, as reqd
- _____ 93. Go to EMU POWERUP AND COMM CHECK, 3-2

POST EMU C/O RECONFIG (5 min)

When EMU C/O for all EMUs complete:

- IV O6 94. UHF MODE – OFF
 - √SPLX/EVA XMIT FREQ – 259.7/414.2
 - √PWR AMP – OFF
 - √SPLX SQUELCH – ON
- R10 _____ 95. BIOMED CH 1,2 (two) – as reqd
- AW82B _____ 96. EV-1, EV-2 O2 vlv (two) – CL
- BOTH DCM _____ 97. Remove SCUs, install DCM covers
- _____ 98. Stow SCU on AAP, Velcro to wall
- IV ML86B:C _____ 99. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl
 (heaters will be deactivated on MCC call)

X: SM 60 SM TABLE MAINT

- 100. Contact MCC for uplink of SM ALERT TMBU (if desired)
 Changes enclosed in _____

Param Name	Param ID	Lower Limit	Upper Limit
EXT A/L H2O LINE T			
EXT A/L H2O SPLY ZN 1 T	0640181	43	145
EXT A/L LCG 2 SPLY ZN 1 T	0640182	49	145
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	145
EXT A/L LCG 2 SPLY ZN 2 T	0640185	45	145
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	OSH

SAFER CHECKOUT (30 min if first checkout of SAFER unit,
20 min for subsequent checks)

NOTE

Procedures written for simultaneous C/O of two SAFERs

- BOTH 1. Remove SAFER and SAFER CHECKOUT RESULTS Cue Card from Stowage Bag/FDF Locker
- PM 2. √Inhibitor installed, properly engaged
- If first SAFER CHECKOUT:
- HCM 3. Remove power switch guard
4. Stow HCM
5. Remove stowage straps from thruster towers, unfold towers
6. Remove SAFER latch guards from latches (leave lanyard straps attached to towers)
7. Inspect:
Thruster tower hinges
Tower latches
√TMG not blocking thrusters
√SAFER latch guard lanyard strap attached to SAFER towers above tower hinges
8. Peel back SAFER tower TMG on both towers and install SAFER latch guards over SAFER latches
√Latch guard lanyards routed under tower TMG
Re-attach tower TMG to secure latch guards in place
9. Fold thruster towers
10. Install stowage straps
- PM 11. MAN ISOL vlv – OP (dn)
12. Deploy HCM; √proper deployment

CAUTION

Minimize time with SAFER powered (~1 min)

NOTE

Have SAFER CHECKOUT RESULTS Cue Card w/proper serial number ready to record status.

From power on to entry into Test Mode, the SAFER will be in Automatic Attitude Hold (AAH) (Green LED on). Try to hold SAFER steady against a wall. Changes in SAFER attitude may result in AAH-induced thruster firings

13. As reqd, review SELF TEST SEQUENCE (refer to box next page)
- HCM 14. Perform Self Test:
Start timer
PWR – TST/ON
Wait until GN2 XX% PWR XX% displayed
√AAH LED (green) on
PWR – ON

Cont next page

NOTE

Be prepared to count thruster clicks (24) after PWR – TST/ON

PWR – TST/ON

Follow displayed instructions on HCM:

√**SELF TEST – WAIT** displayed; if able, count thruster clicks (twenty four)

- * If **NSI CIRCUIT OPEN** or **FAIL: ...** msg *
- * displayed or non-responsive display: *
- * Note failure msg *
- * Press DISP sw to resume test *
- * If **HC TO DETENT** msg displayed: *
- * Note msg *
- * √HC grip springs to center position *

When **RATE CHECK** displayed, rotate SAFER at least + and - 3 deg/sec sequentially in each rotational axis

15. √**GO FOR EVA** or **FAILED TEST** displayed
16. PWR – ON
17. DISP: Record GN2%, PWR%, BATT V (SAFER CHECKOUT RESULTS Cue Card)
18. PWR – OFF
19. Stop timer, record 'ON Time' (~1 min desired)
20. √GN2% ≥ 87
√PWR% ≥ 45
√BATT V ≥ 35
21. Report GN2%, PWR%, BATT V, and SAFER serial number to MCC
- HCM 22. MODE – ROT

CAUTION
Do not stow HCM to be used for EVA with power switch guard installed

NOTE

When stowing HCM, verify that umbilical will not snag during deployment

23. Stow HCM
24. Stow SAFER and Cue Card in Stowage Bag
25. √Inhibitor installed
26. MAN ISOL vlv – CL (up)

SELF TEST SEQUENCE (for reference only; do not perform)

HCM

1. NSI circuit test
2. **SELF TEST – WAIT**; √Twenty-four thruster clicks and THR LED (red) flashing
3. **DEPRESS AAH**
4. **MODE – ROT** (if in TRAN)
MODE – TRAN
5. HC grip detent test
6. **HC +X** (fwd), (-X, +Y (rt), -Y, +Z (dn), -Z, +P (twist up), -P)
7. **RATE CHECK**; rotate SAFER at least + and - 3 deg/sec sequentially in each rotational axis

HOOK
VELCRO

HOOK
VELCRO

SAFER CHECKOUT RESULTS

SAFER SERIAL # _____

	GMT	ON Time	GN2%	PWR%	BATT V		GMT	ON Time	GN2%	PWR%	BATT V
1						27					
2						28					
3						29					
4						30					
5						31					
6						32					
7						33					
8						34					
9						35					
10						36					
11						37					
12						38					
13						39					
14						40					
15						41					
16						42					
17						43					
18						44					
19						45					
20						46					
21						47					
22						48					
23						49					
24						50					
25						51					
26						52					

NOTE

SAFER battery expected to last for 52 1-min checkouts and have at least 45% PWR remaining

BATTERY CHANGEOUT

GMT	OLD BATT SERIAL #	NEW BATT SERIAL #

EVA-3a/O/C

TOP
(Back of 'SAFER CHECKOUT RESULTS')

**HOOK
VELCRO**

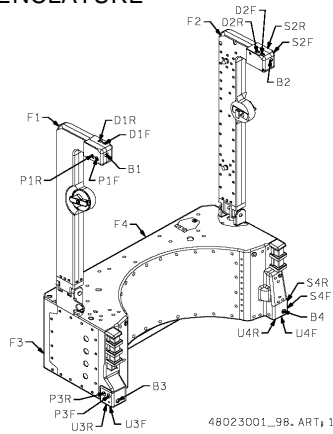
**HOOK
VELCRO**

SAFER STATUS TROUBLESHOOTING

GMT					
Failure Message					NOMINAL STATUS
GN2%					87-99%
PWR%					45-99%
TANK P					> 6575 psia
TANK T					-40 to 140 degF
RATE R					± 30 deg/s
RATE P					± 30 deg/s
RATE Y					± 30 deg/s
DISPL R					± 99.9 deg
DISPL P					± 99.9 deg
DISPL Y					± 99.9 deg
BATT V					≥ 35.0 V
BATT T					50 to 90 degF
Leak					NO LEAK

GMT					
Failure Message					NOMINAL STATUS
GN2%					87-99%
PWR%					45-99%
TANK P					> 6575 psia
TANK T					-40 to 140 degF
RATE R					± 30 deg/s
RATE P					± 30 deg/s
RATE Y					± 30 deg/s
DISPL R					± 99.9 deg
DISPL P					± 99.9 deg
DISPL Y					± 99.9 deg
BATT V					≥ 35.0 V
BATT T					50 to 90 degF
Leak					NO LEAK

SAFER JET NOMENCLATURE



EVA-3b/O/D

(reduced copy)

REBA POWERED HARDWARE CHECKOUT (15 min)

NOTE

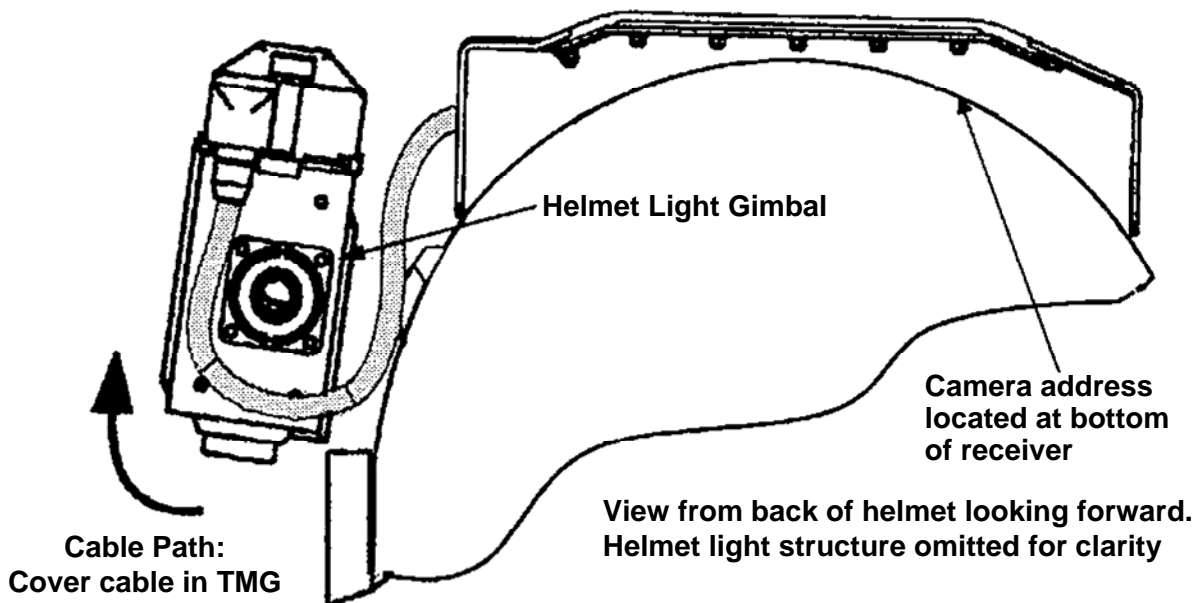
Procedure written for simultaneous C/O of 12 volt HDW on all EMUs

- 1. Perform REBA BATTERY INSTALL (EMU MAINT/RECHARGE), as reqd
- All EMUs 2. √REBA sw (1 per EMU) – OFF (toward left arm of suit)
- If EMU TV:
 - 3. Install EMU TV on helmets 1,2; note camera addresses EV1 ____, EV2 ____ (see figure below)
- PLSS 4. Unstow EMU TV power cable, disconnect from ground plug
- 5. Mate EMU TV power cable to EMU TV
- If no EMU TV:
 - PLSS 6. √EMU TV power cable mated to ground plug
 - 7. √Upper arm connections mated
 - 8. √Glove heater sw (one per glove) – OFF
 - 9. Connect lower arm pwr harness to gloves

NOTE

To avoid excessive battery consumption and heat buildup, deactivate heaters once heat detected at fingertips

- 10. REBA sw (1 per EMU) – ON, pull tab toward right arm of suit
- 11. Glove heater sw (one per glove) – ON
- When heat detected on all outside fingertips:
 - 12. Glove heater sw (one per glove) – OFF
- If EMU TV:
 - 13. EMU TV power pb – press, √Green LED illuminated
 - 14. EMU TV power pb – press, √Green LED not illuminated
- 15. REBA sw (1 per EMU) – OFF, pull tab toward left arm of suit
- 16. Disconnect lower arm pwr harness from gloves
- 17. Stow lower arm and glove pwr harness connectors under TMG
- 18. Disconnect EMU TV power cable from EMU TV
- PLSS 19. Connect EMU TV power cable to ground plug
- 20. Attach LTA Restraint Bag, as reqd



EVA PREP

MIDDECK PREP..... 4-2
EVA PREP 4-3
 PREP FOR DONNING 4-3
 EMU DONNING 4-5
 EMU CHECK..... 4-7
EMU PURGE 4-7
EMU PREBREATHE..... 4-8
 SAFER DONNING 4-8
EVA COMM CONFIG 4-10
EVA COMM DECONFIG 4-10
APPROVED NON-EMU HARDWARE MATRIX 4-11

WARNING

Payload bay floods exceed EMU thermal limits during operation. If EVA crew will be operating in vicinity of PLB floods, floods must be turned off now. Cooldown time may be as long as 6 hr

NOTE

Wireless Video Heater pwr should be activated at least 4 hr before EVA to ensure quality video

MIDDECK PREP (30 min)

- | | |
|-------|---|
| A7 | 1. WIRELESS VID HTR – ON |
| Vol H | 2. Unstow EMU Servicing Kit |
| AW18A | 3. LTG FLOOD (four) – ON |
| | 4. √EVA Bag installed in airlock |
| | 5. √Contamination Detection Kit installed in airlock |
| | 6. √REBA sw – OFF (toward left arm of suit) |
| | 7. √Helmet lights, helmet light batteries, and EMU TVs installed on helmets |
| | If EMU TV: |
| PLSS | 8. √EMU TV power cable demated, connected to ground plug |
| | 9. Disconnect helmets, temp stow |
| HUT | 10. Remove Drink Bag Restraint Bag |

NOTE

Drink bag should be used within 24 hr if filled with non-iodinated water

11. Fill drink bag from galley, remove gas and insert drink bag in Restraint Bag
12. Install Drink Bag Restraint Bag in HUT and dispose of fill tool in wet trash
13. Unstow comm cap and inspect moisture barrier earphone diaphragms (MBEDs) (two) for damage. Replace if reqd (EMU Servicing Kit)
14. Apply anti-fog (EMU Servicing Kit), wipe off:
Helmets (not Fresnel lens)
EV glasses, attach to comm cap
15. Stow EMU Servicing Kit
16. Install helmets, lock
17. Attach Cuff C/L to EMUs
18. √Wrist mirrors installed
19. Stage crew preference items in EMU Equipment Bag as reqd

CAUTION

EV crewmembers should minimize application of hygiene and hydrocarbon-based products prior to EVA day to avoid introduction of irritants into EMU. Reference APPROVED NON-EMU HARDWARE MATRIX, 4-11, for acceptable items in EMU

EVA PREP (90 min)

MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------

X: SM 60 SM TABLE MAINT

1. Contact MCC for uplink of SM ALERT TMBU (if desired)
Changes enclosed in

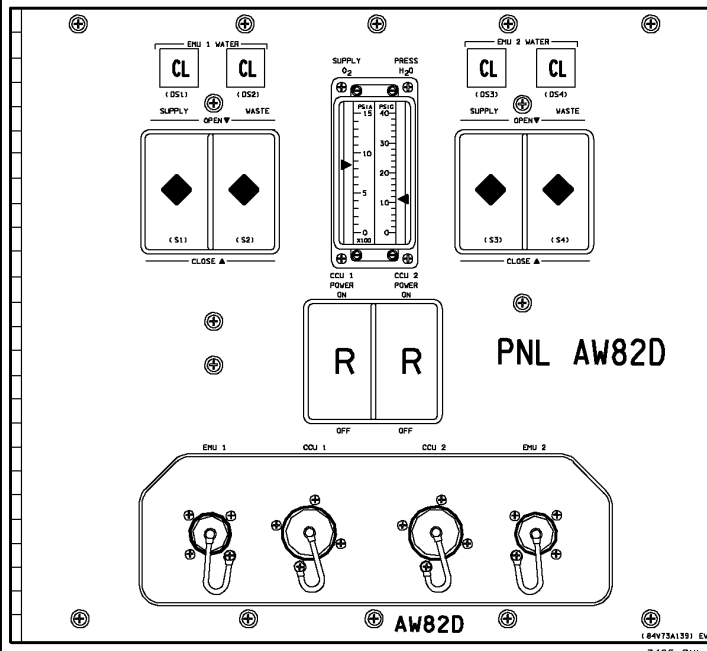
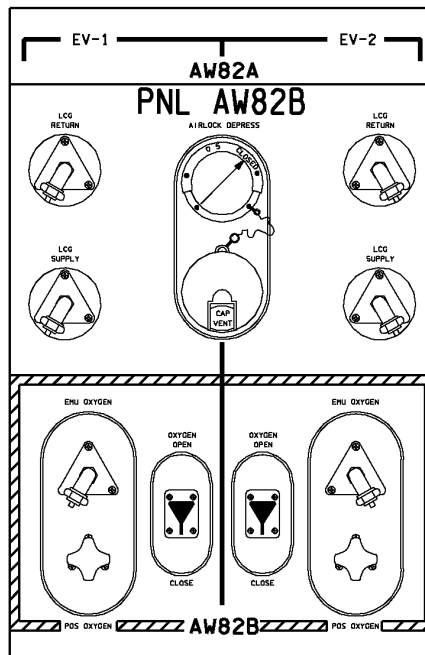
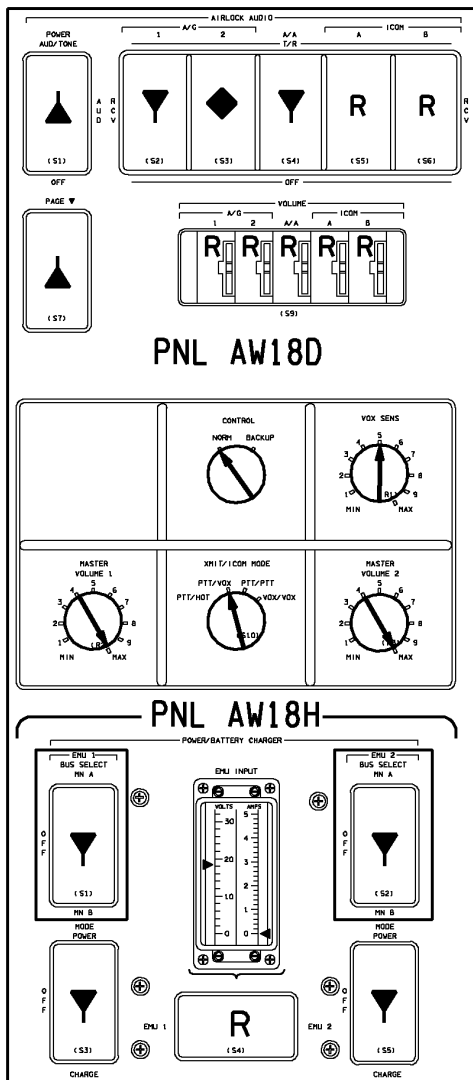
<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T			
SPLY ZN 1 T	0640181	43	100
LCG 2 SPLY ZN 1 T	0640182	36	85
H2O LINE T 2			
SPLY ZN 2 T	0640184	48	100
LCG 2 SPLY ZN 2 T	0640185	36	82
O2 LN T			
SPLY ZN 2 T	0640186	OSL	80

PREP FOR DONNING (30 min)

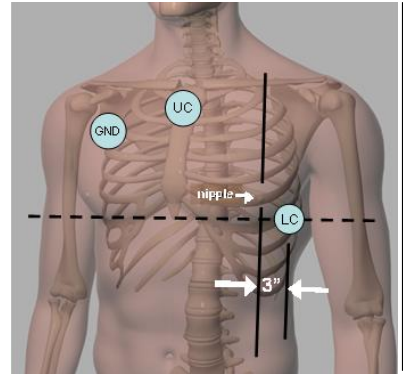
- | | | | |
|------|---------|--|--|
| BOTH | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. Retrieve, position SCU; remove DCM cover |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. Connect SCU to DCM, \sqrt locked |
| | AW82B | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. EV-1, EV-2 O2 vlv (two) – op |
| | MO13Q | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. \sqrt ARLK H2O S/O VLV – OPEN (tb-OP) |
| | MD(flr) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. \sqrt EMU O2 ISOL VLV – OP |
| | ML86B:C | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. \sqrt cb MNC EXT ARLK HTR ZN 1,2 (two) – op |
| | L2 | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. \sqrt O2 XOVR SYS 1,2 (two) – OP |
| BOTH | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. PWR – BATT |

<p>CAUTION</p> <p>EMU must be on BATT pwr when airlock power supply turned on</p>
--

- | | | |
|-------|--|---|
| AW18H | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
BUS SEL (two) – MNA(MNB) |
| DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. PWR – SCU |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. \sqrt STATUS: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> BATT VDC \geq 20.3 |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. Verify panels as shown next page |



- | | | | |
|------|-----|--|--|
| IV | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. Perform EVA COMM CONFIG, steps 2-6 |
| BOTH | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Comm FREQ – LOW |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. COMM mode – PRI (EMU data only, no audio) |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Disconnect, transfer, temp stow LTAs, helmets, additional EMU(s) to middeck |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. Remove Dosimeter from inflight garments; insert in LCVG |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Unstow biomed OBS/EVA cable (EMU Servicing Kit), connect to elec harness |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. Don MAG, TCU, LCVG |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. Don biomed per figure; shave 3-in patch using shave gel and razor (as reqd) (EMU Servicing Kit), clean skin using shave gel and damp towel, dry skin, install stoma seals and apply paste to electrodes, adhere to chest and secure with overtapes |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Don comm caps |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. Connect biomed to elec harness |
| IV | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. Perform EVA COMM CONFIG, steps 7 and 8 (EMU hot mic) |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. Verify biomed signal, EMU data, and RF comm with MCC |
| BOTH | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. COMM mode – HL |



EVA BIOMED PLACEMENT

NOTE

Be prepared to verify a nominal powerup sequence after the next step and verify no missing segments on display and that all tones are audible

- | | | | |
|-------|--|--|---|
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. PWR – BATT |
| | | | Verify no missing segments during display test |
| | | | Verify status (continuous) tone and warble tone audible |
| | | | Verify BITE light extinguishes. Report anomalies to MCC |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 28. PWR – SCU |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 29. Doff comm caps |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 30. Disconnect biomed |
| AW18D | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 31. AIRLK AUD PWR – AUD/TONE |

EMU DONNING (55 min)

NOTE

May be performed by EV1 and EV2 simultaneously

- | | | | |
|------|--|--|--|
| BOTH | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 32. Take one aspirin tablet (325 mg) |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 33. √STATUS: <u>SOP P</u> = 5410-6800 (compare w/gauge) |
| EV1 | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 34. √Waist ring – op |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 35. Don LTA, attach donning handles as reqd |
| | | | If boot bladder manipulation reqd: |
| | | | 36. Disconnect boot from leg (sizing ring) |
| | | | 37. Pull up excess boot bladder around full circumference of boot disconnect |
| | | | 38. Connect boot to leg (sizing ring) |
| | | | 39. Engage Lock 1 |
| | | | 40. √All locks (three per boot) engaged |

- 41. Ingress airlock
- 42. ✓Suit arms aligned
- 43. Disconnect gloves; ✓wrist disconnects – op
- 44. Stow IV glasses
- 45. Don thumb loops
- 46. ✓Drink valve posn before HUT donning
- 47. ✓Biomed elec harness outside of HUT
- PLSS 48. ✓REBA sw – OFF
- 49. Don HUT
- 50. Release thumb loops
- 51. ✓Suit arms aligned
- 52. Don EV glasses as reqd
- 53. Don comm cap
- DCM 54. ✓COMM mode – HL, vol as reqd
- 55. ✓Comm with IV
- 56. Connect biomed to elec harness
- 57. Connect LCVG to multiple water connector, ✓locked
- 58. ✓Thermal cover clear of waist ring
- 59. Waist ring – engage posn
- 60. Connect waist ring to HUT, ✓locked
- 61. Remove donning handles, stow in EMU Equipment Bag; cover waist ring

CAUTION
 Pulling on drink bag blue bite vlv to adjust posn can cause vlv to release from stem

- 62. ✓Drink vlv posn after HUT donning
- 63. ✓Mike boom posn
- 64. Don comfort gloves, wristlets
- 65. Wrist rings – engage posn
- 66. Don EV gloves, ✓locked
- 67. Tighten palm restraint straps

If REBA battery:

- IV 68. ✓Glove heater sw (two) – OFF
- 69. Connect lower arm pwr harness to gloves
- 70. Stow slack under arm TMG
- 71. ✓Cuff C/L posn

CAUTION
 Minimize fan operation with O2 ACT – OFF (~2 min)

- EV1 DCM 72. FAN – ON (PWR RESTART may occur)
- 73. ✓Elec harness clear of neck ring
- 74. Don helmet, ✓locked
- DCM 75. O2 ACT – IV
- 76. ✓Helmet purge vlv – cl, locked
- DCM 77. PURGE vlv – cl (dn)
- If EMU TV:
- PLSS 78. Unstow EMU TV power cable; disconnect from ground plug
- 79. Mate EMU TV power cable to EMU TV
- EV2 80. Repeat steps 33-79 if done serially

EMU CHECK (5 min)

BOTH 81. √Cooling

- * If cooling insufficient slowly cycle temp control vlv *
- * between 7 and Max C while IV depresses and holds *
- * pump priming vlv on back of EMU (30 sec min) *

82. Temp control vlv – as reqd
83. √Wrist rings – covered
84. √Waist rings – covered
- DCM 85. √COMM mode – HL
86. √WATER – OFF
87. √PWR – SCU
88. √FAN – ON
89. √Comm FREQ – LOW
90. √Helmet Light ops
91. √Helmet purge vlv – cl, locked

DCM 92. √PURGE vlv – cl (dn)

93. DISP – STATUS: until **LEAK CHECK?** msg displayed
DISP –YES (hold for 2 sec), follow displayed instructions

- * If **PRESS FAIL/SUIT P X.X** or **LEAKAGE HI | SUIT P X.X**, *
- * go to **FAILED LEAK CHECK (14.7/10.2 PSI)**, CC 6-4 *
- * (Cue Card) *

EMU PURGE

MET / : MET / : MET / :

NOTE

Flex arms and legs periodically and avoid overcooling during purge/prebreathe

CABIN P	PURGE DURATION (min)
10.2	8
14.7	12

- BOTH DCM 1. O2 ACT – PRESS
2. Verify no EMU fit issues
3. PURGE vlv – op (up), begin purge clock
4. When N2 purge complete (per table):
PURGE vlv – cl (dn)
O2 ACT – IV

EMU PREBREATHE

MET ____/____:____	MET ____/____:____	MET ____/____:____
--------------------	--------------------	--------------------

- IV R1 1. Begin prebreathe clock
- 2. O2 TK3 HTR A(B) – as reqd
- 3. Egress AAP, stow handles
- IV AW82B 4. AIRLK DEPRESS vlv cap – vent, remove, stow
- 5. Remove loose equipment
- 6. If reqd, stow REBA jumper cable

CABIN P		PREBREATHE DURATION
10.2	12 hr	01:15
	24 hr	00:40
14.7		04:00

SAFER DONNING (If reqd)

- IV 7. Remove SAFER from Stowage Bag
- 8. Remove stowage straps from thruster towers, stow in EMU Equipment Bag; unfold thruster towers
- 9. Remove SAFER latch guard from SAFER latch (leave lanyard strap attached to thruster tower)
- 10. Inspect:
 - Thruster tower hinges
 - Tower latches
 - √TMG not blocking thrusters
 - √SAFER latch guard lanyard strap attached to SAFER towers above tower hinges
- PM 11. √TMG clear from SAFER striker plate on EMU PLSS
- 12. Remove Inhibitor; close, fasten port cover
- 13. MAN ISOL vlv – OP (dn)
- 14. Latch – PRELOAD
- 15. Rotate latch ccw to recess butterfly in housing

CAUTION
Rotating ccw past soft stop can bind latch

- 16. Rotate latch ccw to soft stop
- If reqd:
 - 17. Rotate latch cw to align latch collar with square bolt head
- 18. Latch – ENG
- 19. Mate PLSS to thruster towers
- 20. Push latch in and rotate cw until stop (~90°)
 - * If latch will not engage: *
 - * Latch – PRELOAD *
 - * Rotate latch ccw until soft stop *
 - * Return to step 17 *
- 21. Latch – PRELOAD
- 22. Rotate latch cw until ratcheting

CAUTION
Rotating ccw may disengage SAFER

- 23. Continue ratcheting until lock marking on latch, tower aligned
- 24. Latch – LCK
- 25. Peel back SAFER tower TMG on both towers and install SAFER latch guards over SAFER latches
 - √Latch guard lanyards routed under tower TMG
 - Re-attach tower TMG to secure latch guards in place
- 26. √Latch butterfly is perpendicular to slot on PLSS
- 27. √Access to HCM deploy lever
- 28. √TMG not blocking thruster
- 29. Repeat for SAFER 2

- As reqd per MCC,
Set battery amp-hours:
- EV1, EV2
DCM 30. DISP – STATUS until BATT? 32.0AH displayed
 31. DISP – YES (hold for 2 sec)
 32. Use DISP to status to desired value
 33. When desired value selected, DISP – YES (hold for 2 sec)
- IV 34. Install MWS and BRTs (as reqd)
 If DCS 760 EVA camera used:
 Charger 35. SW2 CAMERA PWR – OFF (LED off)
 DCS 760 36. Disconnect DCS 760 pwr cable from DC PWR ADAPTER port
 37. Close thermal cover on DC PWR ADAPTER port or connect Ext Camera pwr cable to DC PWR ADAPTER port (as reqd)
 EVA Flash 38. Install flash batteries (two) (as reqd)
 39. ✓EVA tools installed in airlock
 40. As reqd, perform BOOSTER FAN DEACTIVATION/REMOVAL (AIRLOCK CONFIG)
- A/L 41. Remove, stow appropriate vent ducts to allow hatch closure
 MD(flr) 42. As reqd, disconnect vent duct from middeck floor fitting; stow
 43. As reqd, unstow, install diffuser cap on middeck floor fitting
 44. ✓Loose middeck-stowed items clear of inner hatch and middeck diffuser cap air flow
- DCM 45. Remove WATER switch guard (two), stow in EMU Equipment Bag
 46. REBA sw – ON (toward right arm of suit)
 If EMU TV:
 47. EMU TV power pb – press, ✓Green LED illuminated
- If airlock with aft hatch:
 A/L(flr) 48. Deploy floor EVA hatch supports
 49. Egress airlock
 50. Inner hatch – close, lock
 51. ✓Inner hatch Equal vlv caps (two) – removed
 52. Inner hatch Equal vlv (two) – OFF
 53. When prebreathe time complete, ✓MCC for GO to DEPRESS/REPRESS (Cue Card)

EVA COMM CONFIG

NOTE

Wireless Video Heater pwr should be activated at least 4 hr before EVA to ensure quality video

- A7 1. WIRELESS VID HTR – ON
- R14:C 2. √cb MNA UHF EVA – cl
√MNC UHF EVA – cl
- O6 3. √UHF SPLX/EVA XMIT FREQ – 259.7/414.2
√PWR AMP – OFF
√EVA STRING – 1
UHF MODE – EVA
- IVA ATU 4. √AUD A/G 1(2) – T/R
- R10 5. BIOMED CH 1 – EVA 1
2 – EVA 2
- A1R 6. AUD CTR VOICE RCD SEL CH 1 – A/G 1(2)
CH 2 – ICOM A

If docked with ISS and EVA comm on A/G 1:

NOTE

In step 7, A/G 1 docked hardline disabled.
UHF will become A/G 1 Shuttle-to-ISS link

7. √MCC and ISS that UHF configured and in
Public Call
- A1R AUD CTR SPACELAB A/G 1 – OFF
- A1R 8. AUD CTR UHF A/G 1(2) – T/R
√2(1) – OFF
√A/A – OFF

EVA COMM DECONFIG

- A7 1. WIRELESS VID HTR – OFF
- O6 2. UHF MODE – OFF
√SPLX/EVA XMIT FREQ – 259.7/414.2
√PWR AMP – OFF
√SPLX SQUELCH – ON
- If docked with ISS and EVA comm on A/G 1:
- A1R 3. AUD CTR SPACELAB A/G 1 – ON
4. AUD CTR UHF A/G 1(2) – OFF
√2(1) – OFF
√A/A – OFF
VOICE RCD SEL CH 1 – OFF
2 – OFF
- R10 5. BIOMED CH 1,2 (two) – as reqd

APPROVED NON-EMU HARDWARE MATRIX

Item	Part Number	Item	Part Number	Item	Part Number
Passive Dosimeter	SED11100212	Band-Aids	8137004444	Genoptic Ophthalmic Ointment	17478-284-35
Panty Shield	S019BY2033	Band-Aids	8137004431	Kerlix Dressing	6715
Sock	528-40802	Band-Aids	8137004430	Kerlix Dressing	K6715
Sock	ST11C802	Band-Aids	09681	Kling Dressing	6923
Sock Liner	ST17C3309	Band-Aids	555-3036	Lidocaine Jelly	186033036
Ponytail Holder	528-41572	Band-Aid Sheer Dot	4930	Lotrimin Cream	0085-0963-17
Croakie - Modified	528-21224	Band-Aid Strips	NON256602	Moleskin	528-4304-1
GRD Croakie	CP-3-XX-XX1-XX	Band-Aid Sheer Spot	555-8243	Neosporin Plus Cream	0501-3712-05
Croakie	528-41822	Benzoin Swabs	26-06-09	Polysporin Ointment	81079887
Eye Glasses	CP-3-XX-XX-XX	Benzoin Swabs	26-06-19	Polytrim	23782410
OBS Cable	SED42100961	Bioclusive	2461	Povidone Iodine Swabs	26-02-86
OBS Signal Cond	16843	Blistex	1015798221	Pred Forte	1198018001
OBS Sternal Harness	SH42100149	Blistex	10157-9920-2	Proparacaine	998001615
OBS Sternal Harness	SH46115992	Ciloxan 0.3%	0065-0654-35	Providone-Iodine Swabs	4335260286
OBS Sternal Harness	13726	Ciloxan Ointment	65065625	Silvadene Cream	88105020
MBED	528-21260	Ciprofloxacin Ointment	0065-0654-35	Silvadene Cream	61570-131-20
Russian Dosimeter	IBMP-CPD-001	Clotrimazole Cream	5167212751	Steri-Strip	R1547
3" Ace Bandage	23593-130	Cortisporin Ophthalmic	615003675	Steri-Strip	R1546
4" Ace Bandage	54251A7	Coverlets	01306	Tears Naturale	65041830
6" Ace Bandage	54252A7	Cyclogyl	65039715		
4" x 4" Gauze	555-6284	Dermabond	DB12	Tegaderm	1624W
4" x 4" Vaseline Gauze	8884-414600	Dermabond	301128243	Tegaderm Dressing	1626
Adaptec Dressing	K6112	Dermicel Tape	5143	Telfa Pads	890-2865
Adaptec Non-adhering Dressing	2012	Dermicel Tape	5144	Tobrex Solution	65064305
Afrin Nasal Spray	8575608	Elastoplast Tape	23631-040X	Topicort	99207-011-15
Auralgan	46100010	Eye Pads	J8773	Triamcinolone Acetonide Dental Paste	5167212675
Bacitracin	2438506003	Famciclovir	0007-4117-13	Triamcinolone Cream	4580206435
Bactroban Ointment	0029-1527-22	Gauze Pads	2337	VIROPTIC	61570-037-75
Bactroban Ointment	29152544	Gauze Pads	555-6284	Zovirax Ointment	73099394

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EMU STATUS

EMU STATUS

EMU STATUS

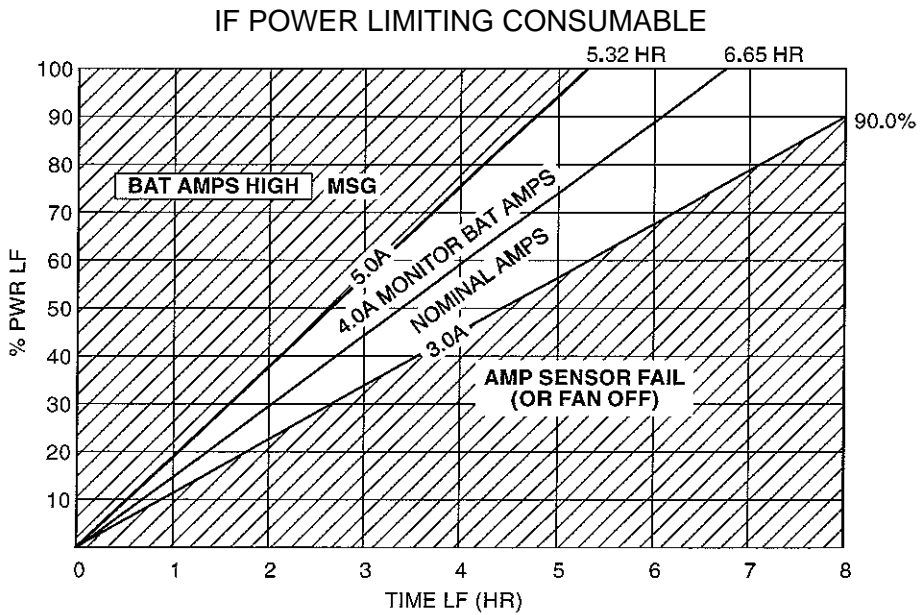
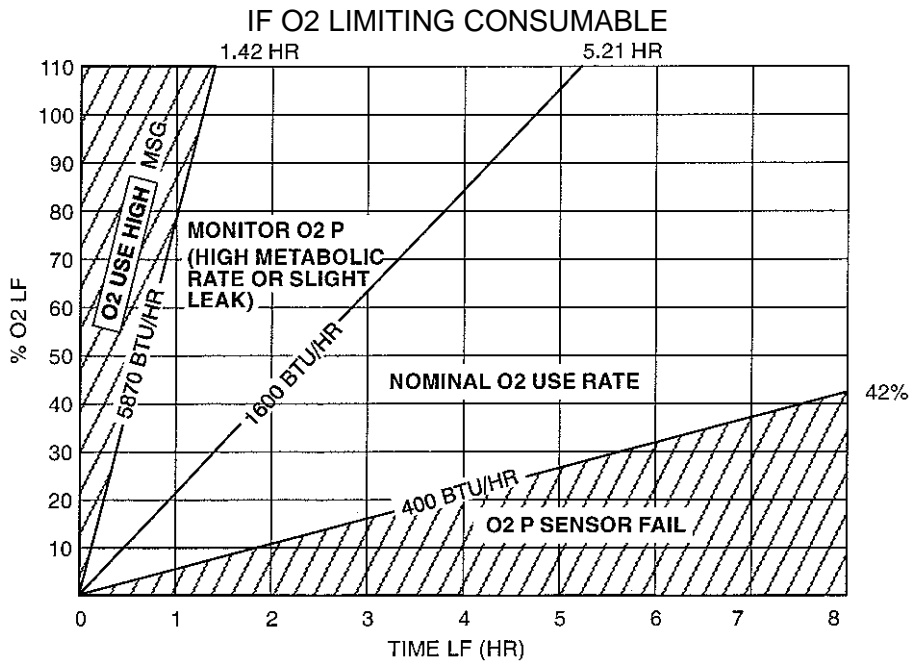
EMU STATUS

I

PARAMETER	NORMAL STATUS	EV1	EV2	EV1	EV2	EV1	EV2
O2 POS	EVA						
SUBLM P	2.0 to 4.2 psia						
TIME EV	HR:MIN since PWR-BATT						
TIME LF	HR:MIN remaining at present use rate						
%PWR (O2) LF	Limiting consumable displayed						
%O2 (PWR) LF	Nonlimiting consumable displayed						
SUIT P	4.2 to 4.4 psid						
	(4.2 to 5.5 psid post depress)						
O2 P	150 to 950 psia						
O2 RATE	0 to 4.0 psi/min						
SOP P	5410 to 6800 psia						
BAT VDC	≥ 16.7						
BAT AMP	3.0 to 4.0						
RPM	18.0 to 20.0 K						
CO2	0.2 to 4.0 mmHg						
H2O TEMP	32 to 75 degF						
H2O GP	14.0 to 16.0 psid						
H2O WP	14.0 to 16.0 psid						
DATA?	COMBO						
BATT	32.0 AH (or as directed)						
GAUGE	4.2 to 4.4 psid						
	(4.2 to 5.5 psid post depress)						

EMU Status Short Stack: Used to periodically (every hour for the first 6.5 hr, then every 10 min) report to MCC-H if the EMU data downlink is not available

PARAMETER	EV	EV	EV	EV	EV	EV	EV	EV
TIME EV								
TIME LF								
%PWR (O2) LF								
%O2 (PWR) LF								



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DEPRESS/
REPRESS

DEPRESS/REPRESS

NOM AIRLOCK

A6-1

EVA/NOM/GEN H

TOP

HOOK VELCRO	DEPRESS/REPRESS	HOOK VELCRO
<p>DEPRESS (10 min) When prebreathe complete</p> <p>DCM 1. √Comm FREQ – LOW 2. COMM mode – PRI</p> <p>AW82B 3. AIRLK DEPRESS vlv – 5, EV ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, stop depress, √MCC *</p> <p>4. Airlock at 6.0, EV ALERT TONE</p> <p>5. When airlock at 5.0, AIRLK DEPRESS vlv – CL, EV ALERT TONE</p> <p>BOTH DCM 6. DISP – STATUS: until <u>LEAK CHECK ?</u> displayed, DISP – YES (hold for 2 sec), follow displayed instructions * If <u>LEAKAGE HI SUIT P X.X</u>, go to <u>FAILED</u> * * <u>LEAK CHECK (5 PSI)</u>, reverse side *</p> <p>7. √O2 ACT – EVA</p> <p>AW82B 8. AIRLK DEPRESS vlv – 0, EV ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, stop depress, √MCC *</p> <p>9. Attach waist tether(s) to A/L D-ring for egress</p> <p>BOTH 10. Airlock dP/dT ~0, EV ALERT TONE 11. When outer hatch ΔP < 0.5, outer hatch – open, stow</p> <p>AW82B 12. AIRLK DEPRESS vlv – CL</p>	<p>PRE REPRESS (5 min)</p> <p>IV ML86B:C 1. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op</p> <p>MD(flr) 2. √EMU O2 ISOL vlv – OP</p> <p>DCM 3. √SCUs connected to DCM 4. √WATER – OFF for 2 min</p> <p>BOTH 5. √Outer hatch closed and locked 6. Disc waist tethers, attach to EMU</p> <p>AW82B 7. √EV-1, EV-2 O2 vlv (two) – OP</p> <p>AW18H 8. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)</p> <p>DCM 9. PWR – SCU, EV WARN TONE (IV record MET __:__:__)</p>	<p>REPRESS (10 min)</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p>WARNING If on SOP, leave O2 ACT – EVA thru airlock repress</p> </div> <p>BOTH DCM 1. O2 ACT – PRESS 2. COMM mode – HL</p> <p style="text-align: center;">NOTE IV expect dP/dT alarm during repress</p> <p>AW82B 3. √AIRLK DEPRESS vlv – CL 4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), EV ALERT TONE 5. Airlock at 4.0, EV ALERT TONE 6. When airlock at 5.0, Equal vlv – OFF, EV ALERT TONE</p> <p>DCM 7. √Airlock pressure integrity (2 min, ΔP ≤ 0.1 psi) 8. √EV Glove heaters – OFF, gloves clean</p> <div style="border: 2px solid black; padding: 5px; text-align: center;"> <p>WARNING If Cuff 1 symp resolve upon repress, report as Cuff 2 If any DCS, leave O2 ACT – PRESS</p> </div> <p>DCM 9. O2 ACT – IV 10. Inner hatch Equal vlv (one) – NORM, EV ALERT TONE 11. Airlock dP/dT ~0, EV ALERT TONE 12. Go to <u>POST EVA</u></p>
<p>POST DEPRESS (5 min)</p> <p>BOTH DCM 1. PWR – BATT, EV WARN TONE (IV record MET __:__:__) <u>PET = 00:00</u></p> <p>AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF</p> <p>3. Disc SCU; install DCM cover</p> <p>4. Stow SCU on AAP, Velcro to wall</p> <p>DCM 5. Temp control vlv – Max H 6. WATER – ON 7. √DCM blank, BITE off 8. Temp control vlv – 3 to MAX C 9. √STATUS, compare to Cuff C/L, 1 (IV record)</p> <p>10. Visors as reqd</p> <p>11. Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline</p> <p>IV ML86B:C 12. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl</p>	<p>EVA-1a/NOM/O/J</p>	

DEPRESS/REPRESS

TOP

<p>HOOK VELCRO</p>	<p>DEPRESS/REPRESS</p>	<p>HOOK VELCRO</p>
<p>DEPRESS (25 min) When prebreathe complete</p> <p>DCM 1. √Comm FREQ – LOW 2. COMM mode – PRI</p> <p>AW82B 3. AIRLK DEPRESS vlv – 5, EV ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, stop depress, √MCC *</p> <p>4. Airlock at 6.0, EV ALERT TONE</p> <p>5. When airlock at 5.0, AIRLK DEPRESS vlv – CL, EV ALERT TONE</p> <p>BOTH DCM 6. DISP – STATUS: until LEAK CHECK ? displayed, DISP – YES (hold for 2 sec), follow displayed instructions * If LEAKAGE HI SUIT P X.X, go to FAILED * * LEAK CHECK (5 PSI), reverse side *</p> <p>7. √O2 ACT – EVA</p> <p>8. √MCC for aft module pressure integrity</p> <p>AW82B 9. AIRLK DEPRESS vlv – 0, EV ALERT TONE, monitor suit P gauge < 5.5 * If gauge > 5.5, stop depress, √MCC *</p> <p>10. Airlock dP/dT ~0, EV ALERT TONE</p>	<p>PRE REPRESS (5 min)</p> <p>IV ML86B:C 1. √cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – op</p> <p>MD(flir) 2. √EMU O2 ISOL vlv – OP</p> <p>BOTH DCM 3. √WATER – OFF 4. √EVA hatch closed, locked 5. Unstow SCU, remove DCM cover, connect SCU, √locked</p> <p>6. Disc waist tethers, attach to EMU</p> <p>AW82B 7. √EV-1, EV-2 O2 vlv (two) – OP</p> <p>AW18H 8. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)</p> <p>DCM 9. PWR – SCU, EV WARN TONE (IV record MET _ _ : _ _)</p>	<p>REPRESS (20 min)</p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <p>WARNING If on SOP, leave O2 ACT – EVA thru airlock repress</p> </div> <p>BOTH DCM 1. O2 ACT – PRESS 2. COMM mode – HL</p> <p style="text-align: center;">NOTE IV1 expect dP/dT alarm during repress</p> <p>AW82B 3. √AIRLK DEPRESS vlv – CL 4. Inner hatch Equal vlv (one) – throttle OFF to NORM (as reqd), EV ALERT TONE 5. Airlock at 4.0, EV ALERT TONE 6. When airlock at 5.0, Equal vlv (two) – OFF, EV ALERT TONE</p> <p>DCM 7. √Airlock pressure integrity (4 min, ΔP ≤ 0.1 psi) 8. √EV Glove heaters – OFF, gloves clean</p> <div style="border: 2px solid black; padding: 5px; text-align: center; margin-bottom: 10px;"> <p>WARNING If Cuff 1 symp resolve upon repress, report as Cuff 2 If any DCS, leave O2 ACT – PRESS</p> </div> <p>DCM 9. O2 ACT – IV 10. Inner hatch Equal vlv (one) – NORM, EV ALERT TONE 11. Airlock dP/dT ~0, EV ALERT TONE 12. Go to POST EVA</p> <p style="text-align: right;">EVA-2a/TNL/O/V</p>
<p>POST DEPRESS (15 min)</p> <p>BOTH DCM 1. PWR – BATT, EV WARN TONE (IV record MET _ _ : _ _) PET = 00:00</p> <p>AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF 3. Disc SCUs; install DCM covers 4. Stow SCUs on AAP, Velcro to wall 5. When EVA hatch ΔP < 0.5, EVA hatch – part op</p> <p>AW82B 6. AIRLK DEPRESS vlv – CL 7. Attach waist tether(s) to A/L D-ring for egress 8. EVA hatch – open, stow</p> <p>DCM 9. Temp control vlv – Max H 10. WATER – ON 11. √DCM blank, BITE off 12. Temp control vlv – 3 to MAX C 13. √STATUS, compare to Cuff C/L, 1 (IV record) 14. Visors as reqd 15. Perform AIRLOCK EGRESS, Cuff C/L, 47, or Flight Specific Timeline</p> <p>IV ML86B:C 16. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl</p>	<p>HOOK VELCRO</p>	<p>HOOK VELCRO</p>

FAILED LEAK CHECK

HOOK
VELCRO

HOOK
VELCRO

FAILED LEAK CHECK (5 PSI)

BOTH
IV Inner
Hatch

DCM

1. Leaking EMU: Repeat leak check on watch and gauge as follows:
O2 ACT – PRESS until SUIT P = 4.2 to 4.4 and stable, compare with gauge then
O2 ACT – IV, start timing
(1 min, Max ΔP = 0.3 psi)
2. If leak check passed:
Return to DEPRESS/REPRESS Cue Card,
DEPRESS, step 7 (suit pressure sensor unreliable) >>
3. O2 ACT – IV
4. Equal vlv (one) – NORM
When ΔP < 0.5, open inner hatch
Equal vlv (one) – OFF
5. Repeat leak check as follows:
√PURGE vlv – cl (dn)
O2 ACT – PRESS, until SUIT P = 4.2 to 4.4 and stable, compare with gauge then
O2 ACT – IV, start timing
(1 min, Max ΔP = 0.3 psi)
6. Contact MCC

EVA-1b/O/J
EVA-2b/O/J

FAILED LEAK CHECK (14.7/10.2 PSI)

NOTE

The following steps are performed on the leaking EMU only

IV

DCM

DCM

DCM

1. Leaking EMU: O2 ACT – PRESS
2. Rotate lower arm assemblies 180 degrees cw and 360 degrees ccw
3. Align suit arms
4. √Sizing rings locked
5. Swivel hips from side to side
6. Repeat leak check as follows:
√Helmet purge vlv – cl, locked
√PURGE vlv – cl (dn)
√O2 ACT – PRESS until SUIT P = 4.2–4.4 and stable (compare w/gauge)
O2 ACT – IV, start timing, 1 min
(during EMU CHECKOUT, 2 min)
(Max ΔP = 0.3 psi)
7. If leak check passed, go to step 11
If leak check failed:
PURGE vlv – op (up), O2 ACT – OFF
FAN – OFF (if EVA PREP)
Cycle/inspect suit disconnects as follows:
Gloves, helmet (leave off), LTA, boots
(if removed in EVA PREP)
FAN – ON (if EVA PREP)
8. Install helmet, repeat leak check step 6, then:
9. If leak check passed, go to step 11
If leak check failed:
PURGE vlv – op (up), O2 ACT – OFF
FAN – OFF (if EVA PREP)
Cycle/inspect suit disconnects as follows:
Gloves, helmet (leave off)
Helmet purge vlv, Sizing rings
LiOH cartridge (O-rings)
FAN – ON (if EVA PREP)
10. Install helmet, repeat leak check step 6, then:
11. If leak check passed:
√Waist ring, wrist rings covered
Continue EMU CHECKOUT or
EVA PREP >>
12. If leak check failed (EMU lost):
Contact MCC

HOOK
VELCRO

HOOK
VELCRO

FLIGHT SPECIFIC TIMELINES

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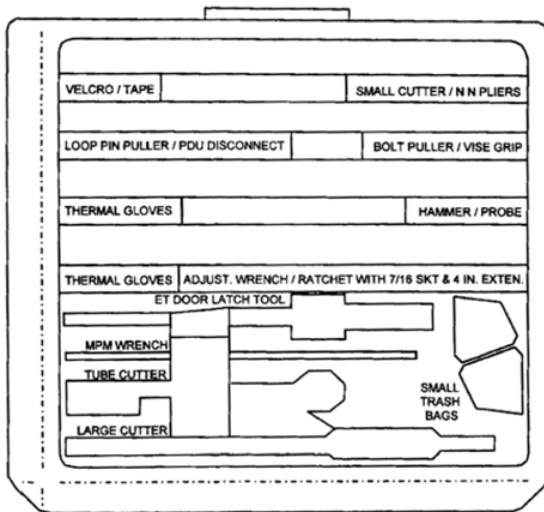
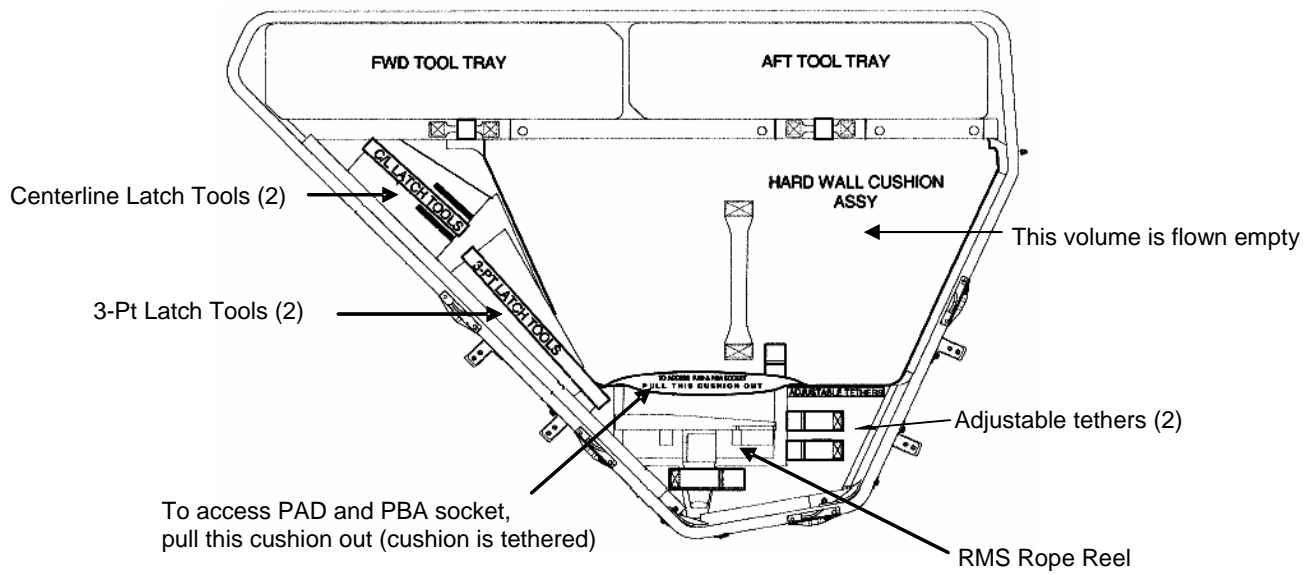
TOOLS AND STOWAGE

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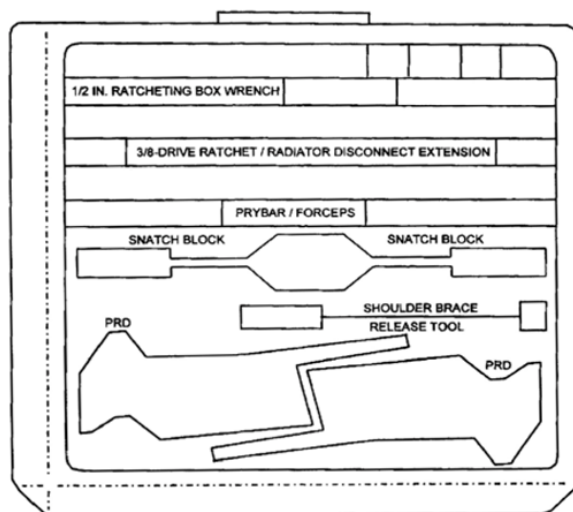
TOOLS AND
STOWAGE

PORT LIGHTWEIGHT TOOL STOWAGE ASSEMBLY (TSA)

I



Forward Tray layout and Labels



Aft Tray Layout and Labels



TOOLS AND STOWAGE

PGT CHECKOUT

1. Unstow PGT
2. ✓PWR – OFF
3. ✓Battery connector covering removed
4. Install battery
5. Ratchet collar – not MTR
6. Cycle MTL settings
7. Cycle bayonette fittings
8. Speed collar – CAL
9. PWR – ON
10. ✓'TRIG TO CAL' on display
11. Press, release trigger to calibrate
12. ✓'CAL PASSED' on display
13. Ratchet collar – MTR
14. ✓Illumination of all LEDs and 'LED TEST' displayed
15. Press trigger and hold
 - ✓BATT VDC \geq 36.0
16. Speed collar – cw
17. Press trigger and ✓drive rotates cw
18. Speed collar – ccw
19. Press trigger and ✓drive rotates ccw
20. To verify programmed settings, cycle MODE/torque collar/speed collar and compare with PGT SETTINGS TABLE
21. PWR – OFF

PGSC-PGT CONNECTION (A31P AND 760XD)

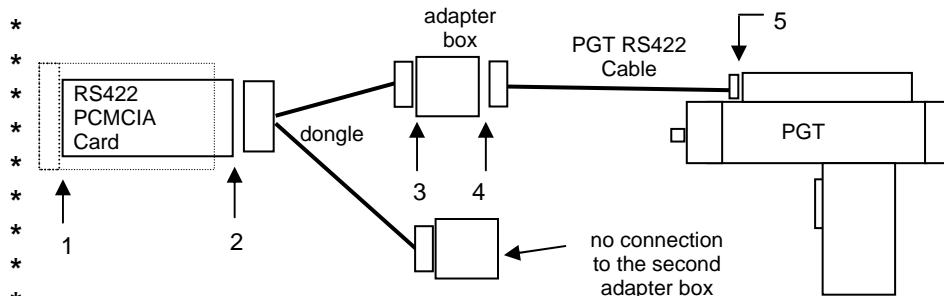
I

- PGSC
- PGT
1. √PGSC equipped with RS422 PCMCIA Card and adapters (two)
 2. √PWR – OFF
 - √PGT Battery installed
 3. Ratchet collar – not MTR

CAUTION
Do not over-torque serial port cover screw

- PGSC
- PGT
- PGSC
4. Open PGT serial port cover using 3/32" Allen Wrench attached to the PGT-RS422 Cable
 5. Connect PGT-RS422 Cable to PGT Remote Programming Port
 6. Connect PGT-RS422 Cable to COM 2 or COM 4 adapter box, as desired
 7. PWR – ON
 - If PGSC not powered:
 8. PGSC PWR – ON
 9. Select SHUTTLE APPS icon on PGSC Windows desktop, then select either 'PGT (COM 2)' or 'PGT (COM 4)' icon
(Use PGT icon corresponding to COM port selected in step 6)
 10. √Tool Communication Check dialog box appears
 - √Serial Connection verified
 - √Intool software version 2.2

- * If dialog box in previous step indicates failure to read software version or
- * reports a communication error, verify electrical connections are fully
- * mated at identified locations below (1-5), then clear dialog box, close
- * application, and repeat steps 9 and 10



- * 1 = RS422 PCMCIA Card to PGSC (check PC card is fully engaged)
- * 2 = RS422 PCMCIA Card to dongle
- * 3 = dongle to adapter box
- * 4 = adapter box to PGT RS422 Cable
- * 5 = PGT RS422 cable to PGT Remote Programming Port

11. Select CONTINUE

PROGRAM PGT SETTINGS

1. Perform PGSC-PGT CONNECTION (A31P AND 760XD)
- If loading settings from a set file in C:\SPOCAPPS\PGT32\SETTINGS:
2. Select FILE, OPEN ...
 3. Select desired settings file, OPEN
 4. Select TORQUE/REVOLUTIONS SETTINGS tab in Pistol Grip Tool Remote Software window
 5. Enter changes to table as necessary
 6. Select SPEED & POWER MANAGEMENT SETTINGS tab
 7. Enter changes to table as necessary
 8. ✓Ratchet collar – not MTR
 9. Select TOOL, SEND DATA TO TOOL
 10. Select desired tables for upload
 11. ✓All sent settings – black on gray (programmed successfully)
- If saving new settings to a file:
12. Select FILE, SAVE AS ...
 13. Type in new file name, SAVE
 14. Verify programmed settings on PGT by cycling MODE/torque collar/speed collar; compare displayed values to expected values

DOWNLOAD/ERASE EVENT LOG

1. Perform PGSC-PGT CONNECTION (A31P AND 760XD)
2. ✓Ratchet collar – not MTR
 3. Select EVENT LOG tab
 4. Select TOOL, GET DATA FROM TOOL...
 5. Select TOOL EVENT LOG DATA (READ-ONLY)
 6. ✓DOWNLOAD PGT EVENT LOG dialog box appears
 7. Select YES to download data
 8. ✓SAVE EVENT LOG DATA TO FILE dialog box appears
 9. Enter name for file
 10. Select SAVE
 11. ✓Event Log data displayed in viewer
 12. If erasing Event Log data from PGT, select OK in ERASE EVENT LOG dialog box

PGT CONTINGENCIES

MESSAGE	CORRECTIVE ACTIONS
BATTERY HITEMP	If alternate battery avail: power off, change battery. Otherwise, power off, switch to Ratchet mode.
BATTERY LOTEMP (blinking)	Drive tool with no load to increase battery temperature. If no joy and alternate battery avail: power off, change battery. Otherwise, power off, switch to Ratchet mode.
BATTERY LOVOLT (blinking)	Continue using until tool is unable to deliver sufficient torque. If no joy and alternate battery avail: Power off, change battery. Otherwise, power off, switch to Ratchet mode.
CAL FAILED	Press, release trigger to repeat calibration. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
COLLAR ERROR	Cycle Torque and Speed collars to clear error. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
COMPAR ERROR	Cycle Torque collar and A/B mode switch. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
EEPROM WR ERR (blinking)	Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
HI TORQ	If fault occurs during engagement and MTL did not slip, ignore message. Otherwise: power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
HICURR	Reattempt operation. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
HYBRID HITEMP	Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
LO TORQ	Reattempt operation until desired torque is reached. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
LOCURR	Reattempt operation. If no joy, power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
LOG IS FULL (blinking)	Continue operation.
MOTOR HITEMP	Power off, switch to Ratchet mode.
OVER CURR	Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.
SLFTST FAIL X	Power cycle, calibrate. If no joy, power off, switch to Ratchet mode.

PGT STANDARD SETTINGS

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SETTINGS	TORQUE SETPOINT (FT-LB)	TORQUE WINDOW (FT-LB)	TORQUE THRESHOLD (FT-LB)	TURNS
A1	2.5	± 1.0	1.0	--
A2	3.8	± 1.0	1.0	--
A3	4.8	± 1.0	1.0	--
A4	6.3	± 1.0	1.0	--
A5	7.0	± 1.0	1.0	--
A6	8.3	± 1.0	1.0	--
A7	9.2	± 1.0	1.0	--
B1	12.0	± 1.0	1.0	--
B2	16.0	± 1.2	1.0	--
B3	18.4	± 1.7	1.0	--
B4	19.4	± 1.9	1.0	--
B5	22.0	± 2.0	1.0	--
B6	24.0	± 2.0	1.0	--
B7	25.5	± 2.0	1.0	--

SETTINGS	CCW1	CCW2	CCW3	CW3	CW2	CW1
SPEED (RPM)	10	30	60	60	30	10

SLEEP TIME	15 min
AUTO – OFF TIME	30 min

MULTI-SETTING TORQUE LIMITER (MTL) SETTINGS
2.5
5.5
10.5
15.5
23.5
30.5

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POST EVA

POST EVA	9-2	
SUIT DOFFING	9-2	
SAFER DOFFING	9-2	
EMU WATER RECHARGE	9-3	
SAFER STOW	9-3	
SUIT DRYING/SEAL WIPE	9-4	
OXYGEN RECHARGE VERIFICATION	9-4	
WATER FILL VERIFICATION	9-4	
EMU POWERDOWN/OVERNIGHT STOW	9-5	

POST EVA

POST EVA (00:45 if NOT performing 'If reqd' proc blocks)
 (01:25 if performing all 'If reqd' proc blocks)

SUIT DOFFING

WARNING
 Do not doff EMU if DCS symptoms resolved during REPRESS. √MCC via PMC

- | | | |
|----------|--|--|
| IV | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 1. When $\Delta P < 0.5$, open hatch |
| MD(flir) | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 2. As reqd, remove diffuser cap at middeck floor, stow |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 3. As reqd, unstow airlock vent duct, connect end to middeck floor fitting |
| A/L | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 4. Configure appropriate vent ducts for airflow into airlock |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 5. As reqd, perform BOOSTER FAN INSTALLATION/ACTIVATION
(<u>AIRLOCK CONFIG</u>) |
| EV | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 6. √Gloves clean |

* If reqd, IV use damp towel to clean gloves *

- | | | | |
|-------|-----|--|---|
| BOTH | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 7. O2 ACT – OFF |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 8. PURGE vlv – op (up) |
| IV | DCM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 9. Install WATER sw guards (two) |
| | | | If EMU TV: |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 10. EMU TV power pb – press; √Green LED not illuminated |
| | | | If REBA battery: |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 11. √Glove heaters sw (one per glove) – OFF |
| PLSS | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 12. REBA sw – OFF (toward left arm of suit) |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 13. Disconnect lower arm pwr harness from gloves |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 14. Stow lower arm and glove pwr harness connectors under TMG |
| | | | If EMU TV: |
| PLSS | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 15. Demate EMU TV power cable, mate to ground plug |
| DCM | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 16. √STATUS: SUIT P < 0.4 (compare w/gauge); disconnect gloves, stow in EMU Equipment Bag |
| | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 17. Disconnect helmet, stow |
| AW82B | | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 18. AIRLK DEPRESS vlv – install cap |

POST EVA

- SAFER DOFFING (10 min) (If reqd)
- | | | |
|----|--|--|
| IV | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 19. Remove SAFER latch guard from SAFER latch (leave lanyard strap attached to thruster tower) |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 20. Latch – ENG |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 21. Rotate latch ccw until release (~90 deg) |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 22. Demate PLSS from thruster towers |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 23. Fold thruster towers |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 24. Transfer to middeck |
| PM | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 25. Install inhibitor (not reqd if SAFER has been used) |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 26. Temp stow SAFER |
| | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 27. Repeat for SAFER 2 |

Cont next page

- PLSS 28. If reqd, unstow REBA jumper cable
 29. AAP release handles to 90°
- BOTH 30. Engage HUT in AAP (IV assist as reqd)
 31. AAP release handles to lock
- DCM 32. FAN – OFF (fwd)
 33. COMM mode – OFF
 34. Doff comm cap
 35. Disconnect waist ring, LCVG, biomed
 36. √Wrist disconnects – op
 37. Doff EV glasses
 38. Doff HUT
 39. Doff LTA, secure to handrail
 40. Remove dosimeter from LCVG; insert in inflight garment
 41. Doff: Biomed (disc OBS/EVA cable, stow in EMU Servicing Kit)
LCVG (secure to HUT)
TCU (allow to dry, as reqd)
MAG, stow in wet trash
- HUT 42. Install Multiple Water Connector cover
 43. Perform EVA COMM DECONFIG (EVA PREP)
- IV R1 44. O2 TK3 HTR A(B) – as reqd
ML86B:C 45. cb MNC EXT ARLK HTR LINE ZN 1,2 (two) – cl

EMU WATER RECHARGE (5 min) (If reqd)

R11L 46. SPLY H2O TKA OUTLET – CL (tb-CL)
 SM 60 TABLE MAINT

CRT 47. Use TKB quantity:
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC

48. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

AW82D 49. √EMU 1,2 H2O WASTE tb (two) – CL
SPLY (two) – OP (tb-OP)

CRT 50. √H2O TKB quantity decreasing

SAFER STOW (10 min) (If reqd)

PM 51. √Inhibitor installed
 52. Latch – PRELOAD
 53. Rotate latch cw until lock markings on latch and tower
recess aligned

54. Push in latch, latch – LCK
 55. Install latch guards over latches under TMG, and reattach TMG
 56. Fold thruster towers
 57. Unstow stowage straps from EMU Equipment Bag; install

PM 58. MAN ISOL vlv – CL (up)
 59. Stow SAFER in Stowage Bag
 60. Repeat for SAFER 2

Cont next page

SUIT DRYING/SEAL WIPE

- 61. Wipe with drying towel:
 - LTA, legs, boots
 - HUT, suit arms
 - Gloves
- 62. Inspect Gloves for damage
Report damage to MCC

WARNING
Avoid stericide contact with eyes. Wash hands thoroughly after application

- 63. Wipe LTA crotch and HUT armpit areas with stericide (in EMU Servicing Kit)
- 64. Lightly wipe seals on LTA waist ring, arm wrist rings, HUT neck ring with lint-free wipe (in EMU Servicing Kit)
- 65. Clean, refurbish biomed
- 66. Remove drink bag from HUT and dispose in wet trash
- 67. ✓ Drink Bag Restraint Bag installed in HUT

OXYGEN RECHARGE VERIFICATION

DCM 68. ✓ STATUS: O2 P ~850 (recharge complete)

WATER FILL VERIFICATION (10 min) (If reqd)

DCM 69. ✓ STATUS: H2O WP 8-15 psi and stable for ~30 sec
(indicates charging complete)

SM 60 TABLE MAINT

- CRT 70. Use TKB quantity:
PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
- R11L 71. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

NOTE

Full charge = ~6%/EMU

- R11L 72. SPLY H2O TKA OUTLET – OP (tb-OP)
- WCS 73. ✓ FAN SEP same as HOSE BLOCK
- 74. MODE – COMMODE/MANUAL/EMU, posn guard over sw
(✓ airflow, WCS ON It on)
- AW82D 75. EMU 1,2 H2O SPLY (two) – CL (tb-CL)
- 76. Install SCOFs, lock
- DCM 77. O2 ACT – IV
- AW82H 78. EMU 1,2 H2O WASTE reg (two) – MAN OP

NOTE

Step 79 will be performed serially for EMU 1 and EMU 2

- AW82D 79. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then
– CL (tb-CL)
– Repeat for other EMU
- AW82H 80. EMU 1,2 H2O WASTE reg (two) – REGULATING
- DCM 81. O2 ACT – OFF
- 82. Remove SCOFs, stow
- WCS 83. MODE – AUTO (✓ WCS ON It off)

EMU POWERDOWN/OVERNIGHT STOW

- 84. Stow comm cap in right arm of EMU
 - 85. Install helmets and covers
 - AW18D 86. AIRLK AUD PWR – OFF
 - AW18H 87. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
PWR/BATT CHGR EMU 1,2 MODE (two) – OFF
 - AW82D 88. √EMU 1,2 H2O WASTE,SPLY tb (four) – CL
 - AW82B 89. EV-1,EV-2 O2 vlv (two) – CL
- If not performing in-suit EMU battery recharge:
- BOTH DCM 90. Remove SCU; install DCM cover
91. Stow SCU on AAP, Velcro to wall
92. Tether LTA to airlock handrail
93. Hang LCVGs, TCUs, and other EMU accessories for drying

If last EVA completed:

- X: SM 60 SM TABLE MAINT
- 94. Contact MCC for uplink of SM ALERT TMBU (if desired)
Changes enclosed in

<u>Param Name</u>	<u>Param ID</u>	<u>Lower Limit</u>	<u>Upper Limit</u>
EXT A/L H2O LINE T 1			
EXT A/L H2O SPLY ZN 1 T	0640181	43	<input type="text" value="145"/>
EXT A/L LCG 2 SPLY ZN 1 T	0640182	<input type="text" value="49"/>	<input type="text" value="145"/>
EXT A/L H2O LINE T 2			
EXT A/L H2O SPLY ZN 2 T	0640184	48	<input type="text" value="145"/>
EXT A/L LCG 2 SPLY ZN 2 T	0640185	<input type="text" value="45"/>	<input type="text" value="145"/>
EXT A/L O2 LN T			
EXT A/L O2 SPLY ZN 2 T	0640186	OSL	<input type="text" value="OSH"/>

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EMU MAINT/RECHARGE

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WATER RECHARGE

IF EMU NOT ALREADY POWERED UP:

EMU POWERUP

- BOTH DCM 1. Retrieve, position SCUs; remove DCM covers
 2. Connect SCUs to DCM, √locked
 3. PWR – BATT

CAUTION

EMU must be on BATT pwr when
 airlock pwr supply is turned on

- AW18H 4. PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
 BUS SEL (two) – MNA(MNB)
 MD(flr) 5. √EMU O2 ISOL VLV – OP
 AW82B 6. EV1,2 O2 vlv (two) – OP
 DCM 7. PWR – SCU

WATER FILL

- MO13Q 8. √ARLK H2O S/O VLV – OPEN (tb-OP)
 R11L 9. √SPLY H2O TKA OUTLET – CL (tb-CL)

SM 60 TABLE MAINT

- CRT 10. Use TKB quantity:
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
 11. Log value before recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

- AW82D 12. √EMU 1,2 H2O WASTE tb (two) – CL
 SPLY (two) – OP (tb-OP)
 13. √H2O TKB quantity decreasing

NOTE

Full charge requires ~15 min

WATER FILL VERIFICATION

- DCM 14. √STATUS: H2O WP 8-15 psi and stable for ~30 sec (indicates charging complete)

SM 60 TABLE MAINT

- CRT 15. Use TKB quantity:
 PARAM ID – ITEM 1 +0 6 2 0 4 2 0 EXEC
 16. Log value after recharge

Recharge #	H2O TKB %
1	
2	
3	
4	
5	

EMU MAINT/
 RECHARGE

Cont next page

NOTE

Full charge = ~6%/EMU

- R11L 17. SPLY H2O TKA OUTLET – OP (tb-OP)
- WCS 18. √FAN SEP same as HOSE BLOCK
- 19. MODE – COMMODE/MANUAL/EMU, posn guard over sw
(√airflow, WCS ON It on)
- AW82D 20. EMU 1,2 H2O SPLY (two) – CL (tb-CL)
- 21. Install SCOFs, lock
- DCM 22. O2 ACT – IV
- AW82H 23. EMU 1,2 H2O WASTE reg (two) – MAN OP

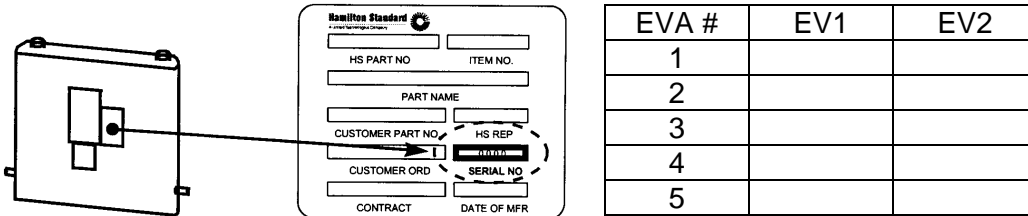
NOTE

Step 24 will be performed serially for EMU 1 and EMU 2

- AW82D 24. EMU 1(2) H2O WASTE (one) – OP (tb-OP) (1 min), then
– CL (tb-CL)
– Repeat for other EMU
- AW82H 25. EMU 1,2 H2O WASTE reg (two) – REGULATING
- DCM 26. O2 ACT – OFF
- 27. Remove SCOFs, stow
- WCS 28. MODE – AUTO (√WCS ON It off)
- 29. If EMU powerup performed, go to EMU POWERDOWN

EMU LiOH CHANGEOUT (20 min)

1. Transfer new cartridges to airlock
2. Transfer new batteries, as reqd, to airlock
3. Release EMU from AAP, posn as reqd
4. Unzip thermal cover, Velcro to top of EMU
5. Record used LiOH serial numbers



6. Remove, mark used LiOH cartridge

IF EMU BATTERY TO BE REPLACED:

AW18H 7. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
 DCM 8. ✓PWR – SCU

CAUTION

Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

9. Remove used battery
10. Install new battery (✓connector alignment), latch

CAUTION

If 10.2 cabin used, possible ΔP across LiOH cartridge caps. Direct ports away from face

Limit exposure time of uncapped canister ports and avoid contact with seals

11. Holding new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first), ✓O-ring seals for damage, install LiOH (attach Velcro retainer strap)
12. Close thermal cover zipper
13. Reinstall EMU in AAP
14. Place caps on used LiOH cartridge
15. Stow used batteries, LiOH in middeck lockers

MIDDECK EMU BATTERY RECHARGE (STAND-ALONE)

I

INITIATE (20 min)

- | | |
|---------|--|
| | 1. Unstow middeck battery charger |
| ML85E | 2. √DC UTIL PWR – OFF on specified utility outlet |
| (MUP) | 3. Affix batteries to charger using Velcro straps on charger |
| | 4. Connect charger cables to batteries |
| | 5. Stow batteries/charger for charge |
| | 6. Connect charger power cable to specified MUP utility outlet |
| | 7. √CB closed for specified utility outlet |
| | 8. DC UTIL PWR – ON |
| Charger | 9. √ON LEDs (red) – ON |
| | √READY LEDs (green) – ON (for 10 sec at startup) |
| | √READY LEDs (green) – blinking |

NOTE

EMU batteries may experience a false charge completion due to passivation within the battery. The passivation is removed with repeated attempts (two to three times) at charging the battery

After 15 min charging, verify charging is continuing:

- | | |
|---------|--------------------------------|
| Charger | 10. √ON LEDs (red) – ON |
| | √READY LEDs (green) – blinking |

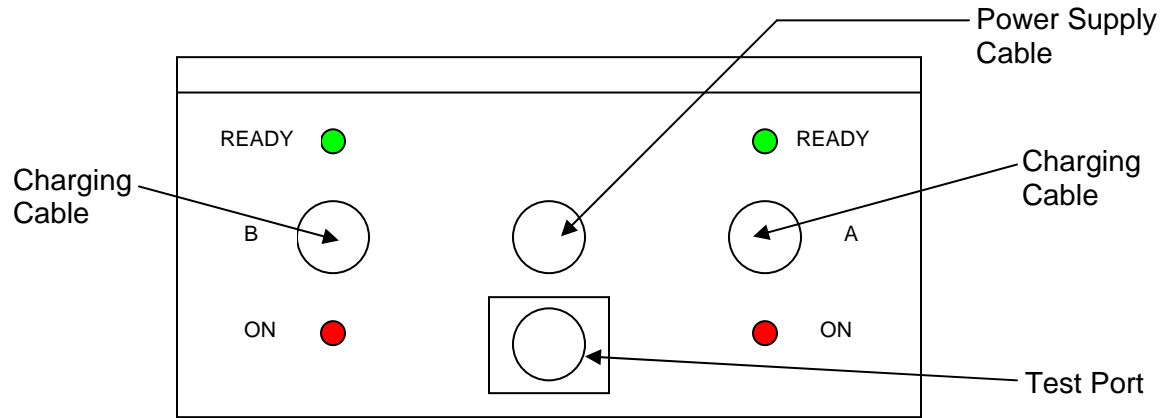
- | | | |
|---------|--|---|
| | * If ON LED (red) is OFF and READY LED (green) is ON | * |
| | * (non-blinking): | * |
| | * 1. DC UTIL PWR – OFF (3 sec) | * |
| | * 2. DC UTIL PWR – ON | * |
| | * 3. √ON LEDs (red) – ON | * |
| Charger | * √READY LEDs (green) – ON 10 sec at startup | * |
| | * √READY LEDs (green) – blinking | * |
| | * 4. Report anomaly to MCC | * |

NOTE

The absence of any active LEDs represents an over-current or overvoltage condition that has caused the charger to shut down, or the charger has not been properly powered from the DC Utility Outlet. All protective conditions are resettable by taking the DC UTILITY POWER to OFF.

During the charge, the red ON LED will be illuminated and the green READY LED will continue to blink, giving positive indication that the charger is still charging

MIDDECK EMU BATTERY RECHARGE (STAND-ALONE) (Cont)



TERMINATE (10 min)

NOTE

When a nominal charge is complete, the red ON LED will extinguish and the green READY LED will illuminate without blinking. The red ON LED will be illuminated only when the positive current flow into the battery is greater than 0.6A

11. When charge complete:
 - Charger √ON LEDs (red) – OFF
 - √READY LEDs (green) – ON
 - ML85E DC UTIL PWR – OFF
 - (MUP) Disconnect cables from batteries
12. Disconnect charger power cable from utility outlet
13. Stow charger and batteries

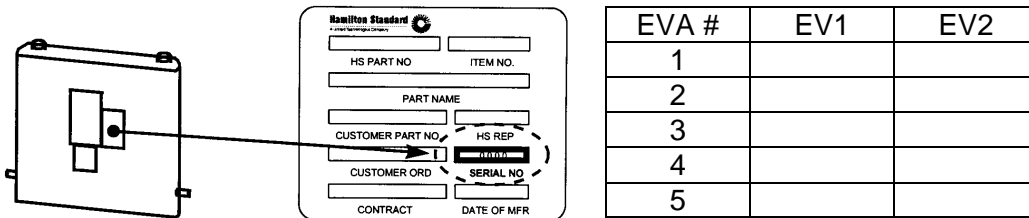
MIDDECK EMU BATTERY RECHARGE/LiOH REPLACEMENT

INITIATE (30 min)

NOTE

Refer to REF DATA for specific plug-in location

1. Unstow new LiOH cartridges
2. Unzip thermal cover, Velcro to top of EMU
3. Record used LiOH serial numbers



- DCM
4. Remove, mark, stow used LiOH cartridge
 5. ✓PWR – SCU

CAUTION

Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

6. Remove, stow used battery

CAUTION

If 10.2 cabin used, possible ΔP across LiOH cartridge caps. Direct ports away from face
Limit exposure time of uncapped canister ports and avoid contact with seals

7. Holding new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first), ✓O-ring seals for damage, install LiOH (attach Velcro retainer strap)
8. Close thermal cover zipper, stow EMU in middeck
9. Unstow middeck battery charger
- _____ 10. ✓DC UTIL PWR – OFF
11. Configure battery(s), charger, and straps for charge
12. Connect charger cable(s) to battery(s)
13. Stow battery(s)/charger for charge
14. Connect power cable to utility outlet
- _____ 15. DC UTIL PWR – ON
- Charger 16. ✓ON LEDs (red) – ON
 ✓READY LEDs (green) – ON (for 10 sec at startup)
 ✓READY LEDs (green) – blinking

NOTE

EMU batteries may experience a false charge completion due to passivation within the battery. The passivation is removed with repeated attempts (two to three times) at charging the battery

After 15 min charging, verify charging is continuing:

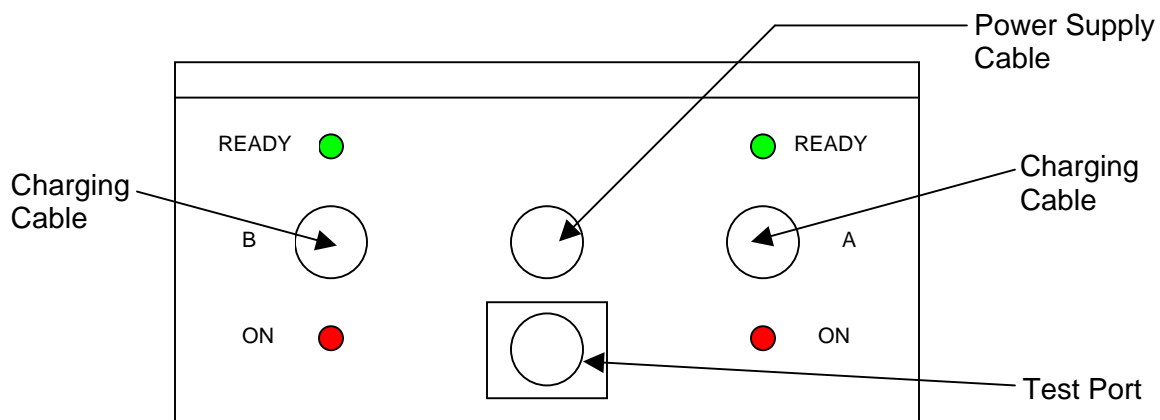
- Charger
17. ✓ON LEDs (red) – ON
 ✓READY LEDs (green) – blinking

- * If ON LED (red) is OFF and READY LED (green) is ON *
- * (non-blinking): *
- * 18. DC UTIL PWR – OFF (3 sec) *
- * 19. DC UTIL PWR – ON *
- * Charger 20. √ON LEDs (red) – ON *
- * √READY LEDs (green) – ON 10 sec*
at startup *
- * √READY LEDs (green) – blinking *
- * 21. Report anomaly to MCC *

NOTE

The absence of any active LEDs represents an over-current or overvoltage condition that has caused the charger to shut down, or the charger has not been properly powered from the DC Utility Outlet. All protective conditions are resettable by taking the DC UTILITY POWER to OFF.

During the charge, the red ON LED will be illuminated and the green READY LED will continue to blink, giving positive indication that the charger is still charging



TERMINATE (15 min)

NOTE

When a nominal charge is complete, the red ON LED will extinguish and the green READY LED will illuminate without blinking. The red ON LED will be illuminated only when the positive current flow into the battery is greater than 0.6A

- Charger 22. When charge complete:
 - √ON LEDs (red) – OFF
 - √READY LEDs (green) – ON
 - DC UTIL PWR – OFF
 - Disconnect cable(s) from battery(s)
- 23. Unzip thermal cover, Velcro to top of EMU
- 24. Remove LiOH cartridge
- 25. Open battery latch
- 26. Install charged battery (√connector alignment); latch
- 27. Reinstall LiOH (attach Velcro retainer strap)
- 28. Close thermal cover zipper

IN-SUIT EMU BATTERY RECHARGE/CHARGE VERIFICATION

INITIATE

1. Retrieve, position SCUs; remove DCM covers
2. Connect SCUs to DCM, √locked
- AW18H 3. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – CHARGE
BUS SEL (two) – MNA(MNB)
4. Continue charge as reqd:
Verification: 15 min, minimum
Full Charge: Up to 20 hr

TERMINATE

- AW18H 5. √PWR/BATT CHGR EMU INPUT AMPS < 1 for both EMUs
6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF
7. Remove SCU, install DCM cover
8. Stow SCU on AAP, Velcro to wall

EMU POWERDOWN

- AW18H 1. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF
- AW82D 2. √EMU 1,2 H2O WASTE,SPLY tb (four) – CL
3. Remove SCU, install DCM cover
4. Stow SCU on AAP, Velcro to wall

HELMET LIGHT/PGT BATTERY RECHARGE

INITIATE (10 min)

NOTE

Refer to REF DATA for specific plug-in location

1. Unstow, as reqd: EHIP Light Battery Charger
EHIP DC PWR/REBA DC EXT Y-Cable
EHIP-PGT Adapter cable (charger to battery) (2)
PGT Batteries (2)
Helmet Light Batteries (4)
2. ✓DC UTIL PWR – OFF
3. Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger, then into orbiter pwr supply
4. DC UTIL PWR – ON
✓Blue LEDs illuminated
 - * If blue LEDs not illuminated: *
 - * ✓DC UTIL PWR – ON *
 - * If blue LEDs still not illuminated: *
 - * DC UTIL PWR – OFF *
 - * Unplug EHIP DC PWR/REBA DC EXT Y-Cable *
 - * from charger *
 - * Change fuse (7.5A) *
 - * Plug EHIP DC PWR/REBA DC EXT Y-Cable *
 - * into charger *
 - * DC UTIL PWR – ON *

IFM Pin Kit

If charging helmet light batteries:

5. Install batteries (four) into charger

If charging PGT batteries, for EACH battery:

6. Release captive screw on PGT battery door using screwdriver
7. Pry open PGT battery door, rotate away from cavity
8. Remove cap from EHIP PGT Adapter cable into charger
9. Remove battery jumper, temp stow on EHIP-PGT Adapter cable cap
Plug EHIP-PGT Adapter cable into battery
10. Install EHIP-PGT Adapter cable into charger
11. ✓Yellow LED illuminated; start timer (MET ____/____:____:____);
temp stow charger

* If yellow LED not illuminated, see chart below *

Indicator	Problem	Solution
Green and red LED illuminated	Cold batt (≤ 50 degF)	Leave batt installed in charger (batt will warm up and automatically change LED to yellow)
Red LED illuminated	Hot batt (≥ 113 degF)	DC UTIL PWR – OFF Remove batt or EHIP-PGT adapter if PGT batt DC UTIL PWR – ON

12. Wait 15 min and check LEDs

If yellow LEDs illuminated:

13. Continue charging

If green LED(s) illuminated:

14. DC UTIL PWR – OFF
15. Remove battery or EHIP-PGT Adapter cable from affected station(s)
16. DC UTIL PWR – ON
17. Wait for blue LED(s) to illuminate
18. Re-install battery or EHIP-PGT Adapter cable
19. ✓Yellow LED(s) illuminated
20. Continue charging

Cont next page

TERMINATE (10 min)

NOTE

Refer to REF DATA for specific plug-in location

1. ✓Green LED illuminated

WARNING

Ensure charger is unpowered before disconnecting batteries

CAUTION

Do not leave batteries installed after unpowering charger to prevent possible charger damage and battery discharge

2. DC UTIL PWR – OFF

If helmet light batteries charged:

3. Remove batteries from charger
4. Install batteries in lights
5. ✓EMU light ops

CAUTION

Do not stow EMU lights in locker with batteries installed

If PGT batteries charged, for each battery:

6. Remove EHIP-PGT Adapter cable from charger
7. Unplug battery from EHIP-PGT Adapter cable; reinstall cap on cable

NOTE

PGT battery will not function if jumper is not installed

8. Re-install battery jumper
9. Rotate battery door into place, tighten screw using screwdriver
10. Mark batteries “charged”, stow in locker
11. Stow as reqd:
 - EHIP Light Battery Charger(s)
 - EHIP DC PWR/REBA DC EXT Y-Cable
 - EHIP-PGT Adapter cables (2)
 - PGT Batteries (2)

REBA BATTERY INSTALLATION

1. Unstow REBA from locker or charger
2. Remove EMU from AAP, unzip TMG to access REBA pouch and EMU power harness
3. ✓Glove heater sw (two) – OFF
4. Remove REBA J1 fabric cover
5. Install REBA on EMU
6. Route REBA sw pull tabs thru TMG loops
7. ✓REBA sw (one per EMU) – OFF (toward left arm of suit)
8. Connect EMU power harness (P1) to REBA (J1); verify locked by gently pulling on EMU power harness cable
9. Zip TMG closed, install EMU on AAP

EMU BATTERY REMOVAL/INSTALL (5 min)

CAUTION

Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

WARNING

EMU pwr switch must be in SCU position with airlock pwr OFF during battery changeout

DCM

1. √PWR – SCU

If SCU connected to DCM:

AW18H

2. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF

PLSS

3. Release EMU from AAP as reqd
4. Unzip thermal cover, Velcro to top of EMU
5. Open LiOH(Metox) latches
6. Rotate LiOH(Metox) canister outward until softstop or remove canister
7. Open battery latches
8. Remove/install EMU battery as reqd (√connector alignment)
9. Close battery latches
10. Reinstall LiOH(Metox), latch
11. Close thermal cover
12. Reinstall EMU in AAP as reqd
13. Stow or charge batteries as reqd

HELMET LIGHT BULB CHANGEOUT (15 min)

NOTE

Light assembly has several loose pieces which may be spring loaded. Be prepared to capture them during changeout

CAUTION

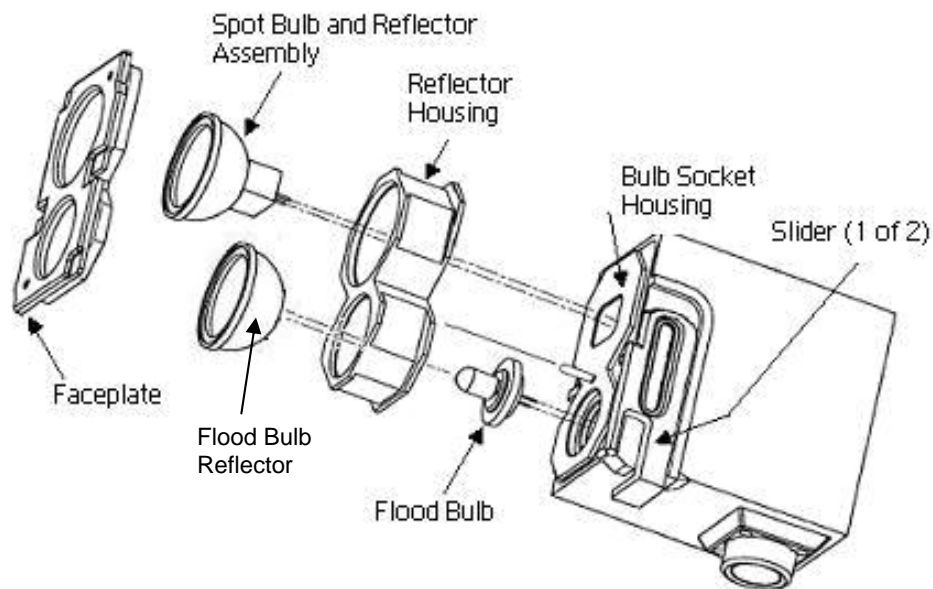
Handle bulbs with care. Do not touch bulbs with bare hands (could degrade bulb life span)

1. Remove battery from affected side of lights
2. If EMU TV installed, remove camera from affected side of lights
3. Obtain, don comfort glove
4. Depress faceplate; open faceplate sliders (two) on affected side of lights
5. Remove faceplate
6. Remove reflector housing by pulling straight out
7. Remove affected bulbs as reqd, replace
8. Mark, stow used bulbs

NOTE

Contacts on spot bulb may be difficult to reseal fully into socket

9. Install reflector housing and flood bulb reflector, seat spot bulb
10. Install faceplate, lock sliders (two)
11. Install battery; ✓EMU light ops
12. If EMU TV installed, attach camera back to affected side of lights
13. Remove, stow comfort glove



REBA BATTERY RECHARGE

INITIATE (10 min)

NOTE

Refer to REF DATA for specific plug-in plan location

1. Unstow: REBA Charger
EHIP DC PWR/REBA DC EXT Y-Cable
25' REBA/EHIP Ext Pwr cable (if reqd)
2. ✓DC UTIL PWR – OFF
If in-suit recharge:
 3. Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger, 25' REBA/EHIP Ext Pwr cable into EHIP DC PWR/REBA DC EXT Y-Cable, 25' REBA/EHIP Ext Pwr cable into orbiter power supply
 Else:
 4. Plug EHIP DC PWR/REBA DC EXT Y-Cable into charger and orbiter power supply
5. DC UTIL PWR – ON
✓Blue LEDs (two) illuminated
 - * If blue LED not illuminated: *
 - * ✓DC UTIL PWR – ON *
 - * ✓cb – cl *
 - * ✓Cable connections mated *
 - * If blue LED still not illuminated: *
 - * DC UTIL PWR – OFF *
 - * Unplug EHIP DC PWR/REBA DC EXT Y-Cable *
 - * from charger *
 - REBA * Change fuse (4.0 Amps) *
 - Charger * Plug EHIP DC PWR/REBA DC EXT Y-Cable *
 - * into charger *
 - * DC UTIL PWR – ON *
- REBA 6. ✓REBA sw (two) – OFF
7. Demate REBA jumper cables (two)
8. Mate charger cables (two) to REBA jumper cables
- REBA 9. ✓Yellow LEDs (two) illuminated; temp stow charger on wall
Charger

* If yellow LED not illuminated, see chart below *

Indicator	Problem	Solution
Green and red LED illuminated	Cold batt (≤ 50 degF)	Leave REBA connected to charger (REBA will warm up and automatically change LED to yellow)
Red LED illuminated	Hot batt (≥ 113 degF)	Leave REBA connected to charger (REBA will cool and LED will automatically change to yellow)

TERMINATE (10 min)

NOTE

Refer to REF DATA for specific plug-in plan location

1. When green LEDs (two) illuminated, disconnect REBAs from charger
2. Mate REBA jumper cables
3. DC UTIL PWR – OFF
4. Stow: REBA Charger
EHIP DC PWR/REBA DC EXT Y-Cable
25' REBA/EHIP Ext Pwr cable (if reqd)

POST EVA ENTRY PREP

POST EVA ENTRY PREP (45 min if SAFER not flown)
(55 min if SAFER flown)

POST EVA
ENTRY PREP

- AW18D 1. AIRLK AUD PWR – OFF
- AW18H 2. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF
- MD(flr) 3. EMU O2 ISOL VLV – CL
- AW82B 4. EV-1, EV-2 O2 vlv (two) – CL
- AW82D 5. √EMU 1,2 H2O WASTE, SPLY tb (four) – CL
- 6. Stow in FDF locker: DEPRESS/REPRESS (Cue Card)
Cuff C/L (two)
- 7. Disconnect comm caps (two) from elec harness, temp stow
- 8. Remove LTA, √Multiple Water Connector cover installed
- 9. Stow LCVG and EV Crew Options Kit (ECOK) in HUT
- 10. Connect LTA to HUT
- 11. Install gloves
- 12. √Any wrist tethers attached to glove tether loop with only one hook (other hook on D-ring or first hook) and cinched down around wrist
- If REBA:
- 13. Remove REBA batteries from all EMUs, stow

CAUTION
EMU TV and helmet lights must be removed prior to landing

If EMU TV:

- 14. Remove EMU TVs from helmet lights, stow
- 15. Transfer EMU lights to middeck
- 16. Install helmets and covers, lock
- 17. Remove SCU, install DCM cover
- DCM 18. Stow SCU on AAP, rebuckle straps
- 19. √PURGE vlv – op (up)
- 20. Perform LTA RESTRAINT STRAP INSTALLATION (AIRLOCK CONFIG)
as reqd for landing configuration
- 21. Attach LTA Restraint Bags over LTA, suit arms; tighten straps
- 22. Stow comm caps in LTA Restraint Bag pouch
- 23. Install and loosely secure airlock floor pallet using 1/4-in drive ratchet, 4-in ext w/1/4-in drive, and 1/2-in socket w/1/4-in drive. Torque to 200 in-lb using torque wrench

SAFER ENTRY STOW (10 min) (if reqd)

- 24. Deploy HCM
- 25. Install pwr sw guard
- 26. Stow HCM in foam outside of SAFER
- 27. Stow SAFER in stowage bag

- 28. Install additional EMU(s)/Airlock Stowage Bag(s) in airlock; √bag, strap installed
- 29. Install 20-g Crash Bag on middeck EMUs (if flown)
- 30. Remove batteries from lights, stow in lockers

CAUTION
To prevent possible equipment damage, do not stow EMU lights in locker with batts installed

- Vol H 31. Stow EMU lights, EMU Equipment Bag, EVA Bag in middeck
- Inner Hatch 32. Equal vlv (two) – NORM, install caps
- * If outer hatch leaking or integrity suspect: *
- * Equal vlv (two) – OFF, install caps *
- 33. Inform MCC, Post EVA Entry Prep complete

POST ISS EVA ENTRY PREP (45 min if SAFER not flown)
(55 min if SAFER flown)

- MD(flir) 1. EMU O2 ISOL VLV – CL
- AW18D 2. AIRLK AUD PWR – OFF
- AW18H 3. √PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
MODE (two) – OFF
- AW82B 4. √EV-1, EV-2 O2 vlv (two) – CL
- AW82D 5. √EMU 1,2 H2O WASTE, SPLY tb (four) – CL
- 6. √No helmet lights or EMU TV installed on helmets
- 7. Remove helmets, temp stow
- 8. Disconnect comm caps from EMU electrical harness, temp stow
- 9. Remove LTA, √Multiple Water Connector cover installed
- 10. √Only LCVG and EV Crew Options Kit (ECOK) in HUT
- 11. Connect LTA to HUT
- 12. √Gloves installed, locked
- 13. √Any wrist tethers attached to glove tether loop with only one hook (other hook on D-ring or first hook) and cinched down around wrist
- 14. Install helmets, lock
- 15. Install helmet covers if not already installed
- 16. √SCU stowed on AAP, straps buckled
- DCM 17. √PURGE vlvs – op (up)
- Vol H 18. √No loose items temp stowed in Vol H (waist tethers, etc). Install as reqd
- 19. Attach LTA Restraint Bags over LTA, suit arms, tethers; tighten straps
- 20. Stow comm caps in LTA Restraint Bag pocket
- If airlock floor pallet removed:
- 21. Install and loosely secure airlock floor pallet using 1/4–in drive ratchet, 4–in ext w/1/4–in drive, and 1/2–in socket w/1/4–in drive. Torque to 200 in–lb using torque wrench
- 22. Install floor Airlock Stowage Bag in airlock; √bag, strap installed
- 23. Install 20-g Crash Bag on middeck EMUs (if flown)

SAFER ENTRY STOW (10 min) (If SAFER returning)
 24. Deploy HCM
 25. Install power switch guard ('PWR' over PWR switch)
 26. Stow HCM in foam outside of SAFER
 27. Stow SAFER in stowage bag

- Inner Hatch 28. Equal vlv (two) – NORM, install caps
- * If outer hatch leaking or integrity suspect: *
- * Equal vlv (two) – OFF, install caps *
- 29. Inform MCC, Post ISS EVA Entry Prep complete
- 30. Stow in FDF/ODF locker (if reqd):
 FDF EVA Checklist
 Used EVA Prebreathe Cue Card
 ISS EVA Systems Checklist

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OFF-NOMINAL PROCEDURES

----- OFF-NOMINAL PROCS -----

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EMU CONTINGENCY PROCS

DISPLAY LOSS DURING POWER TRANSFER (WARM RESTART)	12-2
VACUUM H2O RECHARGE (MANNED)	12-2
LiOH REPLACEMENT (MANNED)	12-3
BATTERY REPLACEMENT (MANNED)	12-4
WATER DUMP	12-6
SCU SWAP (UNMANNED)	12-7
(MANNED)	12-7
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12.1 STS EVA DECONTAMINATION	12-8
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SAFER BATTERY CHANGEOUT	12-18
BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)	12-19
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BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING)	12-21
BTA PREP	12-21
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EMU RESIZE	12-24

**EMU CONT
PROCS**

EV AW82D 16. √EMU 1(2) H2O WASTE – CL (tb-CL)
SPLY – OP (tb-OP)

WARNING
O2 will be off. IV stand by inner hatch
Equal vlvs for emergency repress

EV DCM 17. O2 ACT – OFF, monitor SUIT P (√SUIT P > 3.6)

- * When SUIT P ≤ 3.6: *
- * O2 ACT – PRESS until SUIT P = 4.2-4.4 *
- * – OFF *

18. √STATUS: H2O WP ~8-15 psi and stable for ~30 sec (indicates charging complete), then:
O2 ACT – PRESS until SUIT P = 4.2-4.4
– EVA

IV R11L If SPLY H2O XOVR VLV closed (tb-CL or bp) (water transfer config):

19. SPLY H2O TKA OUTLET – OP (tb-OP)
If SPLY H2O XOVR VLV open (tb-OP) (nominal config):

20. SPLY H2O TKC INLET – OP (tb-OP)
TKB OUTLET – OP (tb-OP)

ML31C 21. SPLY H2O TKD OUTLET – OP (tb-OP)

22. If FES reqd, perform TOPPING FES STARTUP (ORB OPS, ECLS)

EV AW82D 23. EMU 1(2) H2O SPLY – CL (tb-CL)

NOTE

Disregard fault msgs until CWS updated with: O2
ACT – EVA, WATER – ON, and H2O TEMP < 60

24. Go to DEPRESS/REPRESS Cue Card, DEPRESS, step 11
(POST DEPRESS, step 1, if tunnel adapter)

LiOH REPLACEMENT (MANNED)

CAUTION
If 10.2 cabin used, possible ΔP across LiOH
cartridge caps. Direct ports away from face
Limit exposure time of uncapped canister
ports and avoid contact with seals

- IV 1. Unstow new LiOH cartridge with aluminum plate serial number facing self, remove caps (left first)
- IV 2. Unzip EMU thermal cover, fold back, Velcro to top of EMU

WARNING
Fan will be off during changeout. Perform
changeout as quickly as possible

CAUTION
Vent loop is pressurized. Restrain LiOH cartridge

- DCM 3. √O2 ACT – IV
- 4. Helmet purge vlv – op
- 5. FAN – OFF

- IV EMU 6. Remove used cartridge
- 7. Holding new LiOH cartridge with aluminum plate serial number facing self, √O-ring seals for damage, install LiOH (attach Velcro retainer strap)

NOTE

EMU may issue CO2 HIGH or MONITOR CO2 message

- DCM 8. FAN – ON (PWR RESTART may occur)
- 9. Helmet purge vlv – cl, locked
- DCM 10. O2 ACT – PRESS
- 11. PURGE vlv – op (up)
- 12. Begin timing 2-min purge
- IV EMU 13. Close EMU thermal cover zipper
- 14. Place caps on used LiOH cartridge
- IV 15. Mark used cartridge, stow in middeck
- When purge time = 2 min:
- DCM 16. √STATUS: CO2 < 8.0 mmHg, then PURGE vlv – cl (dn)
- 17. O2 ACT – IV

NOTE

A minimum of 40 min of prebreathe reqd to condition LiOH cartridge

- 18. Continue EVA PREP or EMU PREBREATHE with minimum of 40 min prebreathe

BATTERY REPLACEMENT (MANNED)

- IV 1. Unstow new battery

CAUTION
Do not allow battery to impact airlock wall and use care when handling/stowing battery to avoid damaging aluminum cover

- PLSS 2. Unzip EMU thermal cover, fold back, Velcro to top of EMU

WARNING
Power switch must be in SCU during battery changeout
Fan will be off during changeout. Perform changeout as quickly as possible

- DCM If no SCU power available:
- 3. √O2 ACT – IV
- 4. Helmet purge vlv – op
- 5. FAN – OFF

NOTE

EMU will be without comm after step 6 until battery power is restored at step 18

- DCM 6. PWR – SCU
- If degraded/dead battery:
- DCM 7. √PWR – SCU
- 8. √O2 ACT – IV
- 9. Helmet purge vlv – op
- DCM 10. FAN – OFF (fwd)
- PLSS 11. Open battery latch
- 12. Open LiOH cartridge latches

WARNING

Vent loop is pressurized. Restrain LiOH canister during battery changeout to avoid injury and breaking seal

- 13. Rotate LiOH cartridge outward until limited by Velcro retainer strap
- 14. Remove used battery
- 15. Install new battery (✓connector alignment); engage latch
- 16. ✓LiOH cartridge seated in vent ports, rotate downward until latch pins engage
- 17. Close LiOH cartridge latches
- If no SCU power available:
 - DCM 18. PWR – BATT
 - 19. FAN – ON (aft) (PWR RESTART may occur)
 - 20. Helmet purge vlv – cl, locked

- | | | |
|------|--------------------------------|---|
| * | If LiOH cartridge seal broken: | * |
| *DCM | 21. O2 ACT – PRESS | * |
| * | 22. PURGE vlv – op (up) | * |
| * | 23. Begin 2 min purge | * |
| * | When 2 min complete: | * |
| *DCM | 24. PURGE vlv – cl (dn) | * |
| * | 25. O2 ACT – IV | * |

- DCM 26. ✓STATUS: BATT VDC
- 27. Report following to MCC as comm permits:
 - Old battery barcode/serial number and stowage location
 - New battery barcode/serial number and BATT VDC reading
- 28. Close EMU thermal cover zipper

NOTE

EMU-calculated TIME EV and TIME LF do not reset despite battery changeout. A cold restart is reqd to reset those parameters

- 29. If reqd per MCC, perform EMU COLD RESTART (EMU CONT PROCS)
- 30. Continue EVA PREP

SCU SWAP (UNMANNED)

- BOTH DCM 1. √FAN – OFF
- 2. √O2 ACT – OFF
- 3. √COMM mode – OFF
- AW18H 4. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
- DCM 5. Swap SCUs
- 6. PWR – BATT
- AW18H 7. √PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
- 8. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)
- 9. √EMU INPUT 1,2 volts = 18.0-20.0
- DCM 10. PWR – SCU

SCU SWAP (MANNED)

- BOTH DCM 1. Temp control vlv – Max C
- O6:A1R 2. Perform EVA COMM CONFIG (EVA PREP), steps 3, 4, and 8
- DCM 3. COMM mode – PRI
- 4. √Comm FREQ – LOW
- 5. PWR – BATT
- AW18H 6. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – OFF
- DCM 7. Swap SCUs
- AW18H 8. √PWR/BATT CHGR EMU 1,2 MODE (two) – PWR
- 9. PWR/BATT CHGR EMU 1,2 BUS SEL (two) – MNA(MNB)
- 10. √EMU INPUT 1,2 volts = 18.0-20.0
- DCM 11. PWR – SCU
- 12. COMM mode – HL
- 13. Temp control vlv – as reqd

EMU COLD RESTART (MANNED)

WARNING

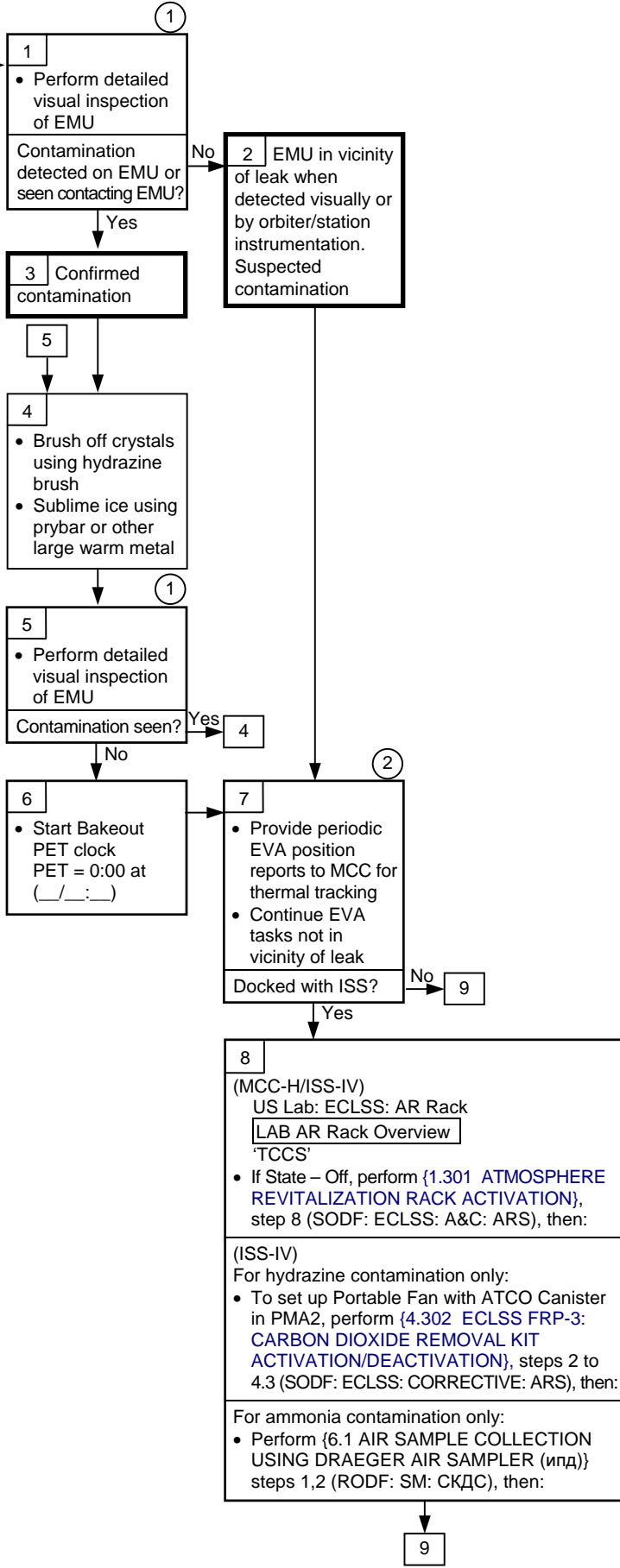
This procedure should only be used at airlock pressures of 8.0 psi and higher. Fan and O2 will be off during restart. Perform restart as quickly as possible

- DCM 1. FAN – OFF
- 2. O2 ACT – OFF
- If PWR – SCU:
 - 3. PWR – BATT (2 sec)
 - 4. PWR – SCU
- If PWR – BATT:
 - 5. PWR – SCU (2 sec)
 - 6. PWR – BATT
- 7. O2 ACT – IV
- 8. FAN – ON

12.1 STS EVA DECONTAMINATION

Crew Visually Detects Plume, Leaking QD, White Crystals, or "Snow" Coming from Orbiter/Station During EVA

Orbiter/Station Chemical System Leak Suspected Due to Steady (not Step Function) Decrease in Pressure or Temperature

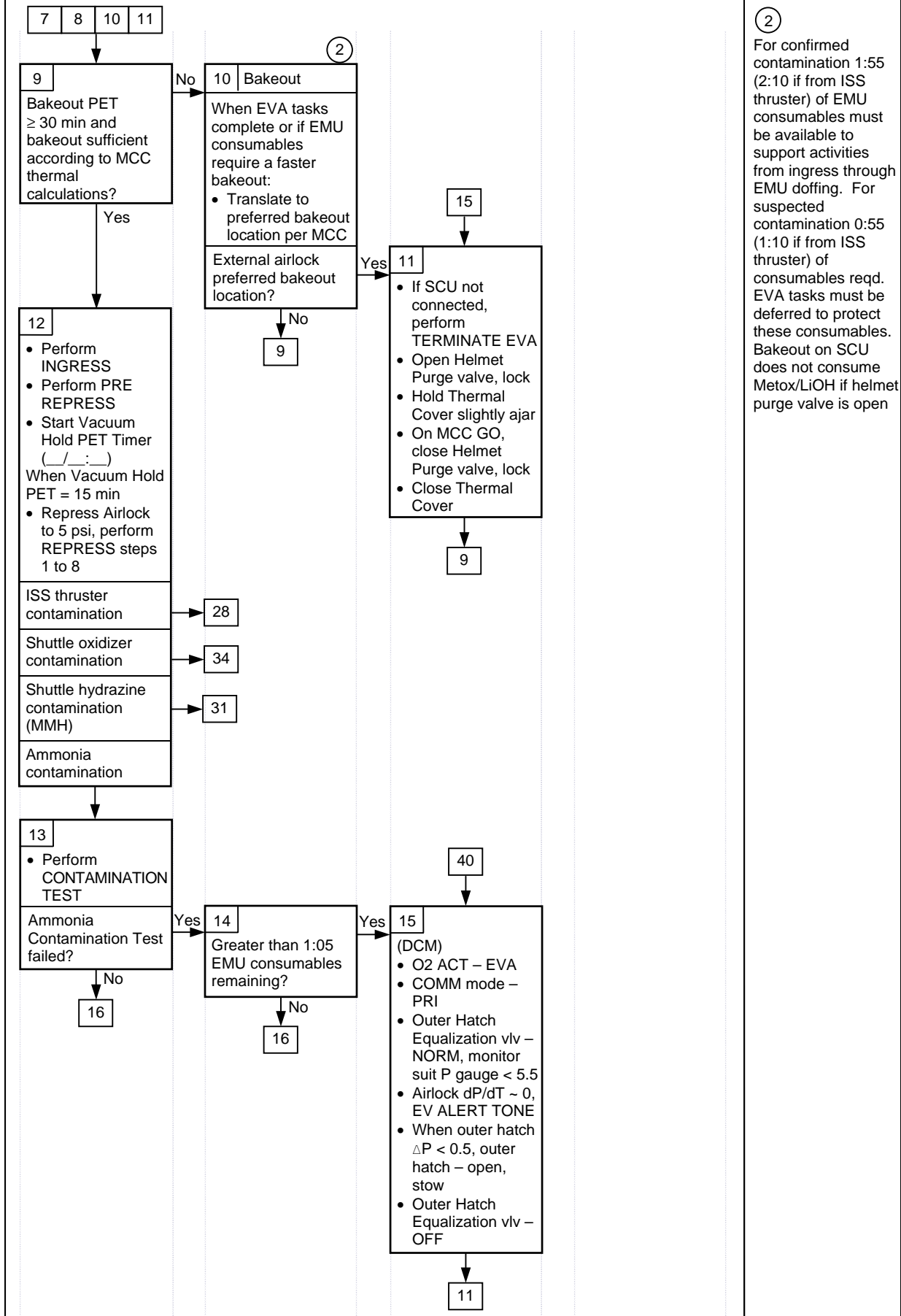


① Ammonia visual inspection should be performed in night or shaded ambient light with helmet spot lights used to illuminate TMG. Use of sunvisor during inspection should be avoided. View TMG from an oblique angle. Following are indications of ice on EMU:

- Loss of TMG thread pattern
- Waxy gloss or hard pack snow appearance
- Unusual contours

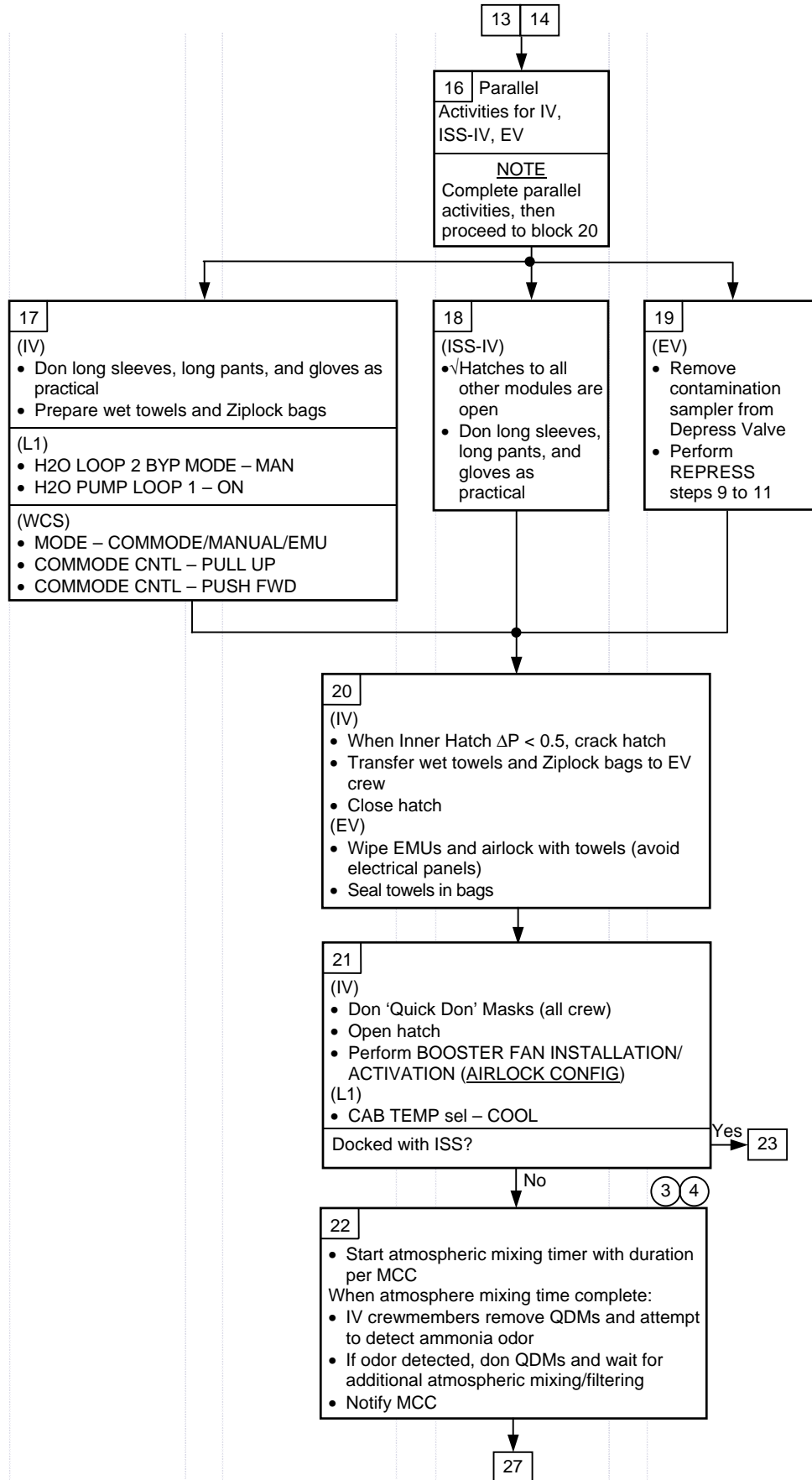
② For confirmed contamination 1:55 (2:10 if from ISS thruster) of EMU consumables must be available to support activities from ingress through EMU doffing. For suspected contamination 0:55 (1:10 if from ISS thruster) of consumables reqd. EVA tasks must be deferred to protect these consumables. Bakeout on SCU does not consume Metox/LiOH if helmet purge valve is open

12.1 (Cont)



②
For confirmed contamination 1:55 (2:10 if from ISS thruster) of EMU consumables must be available to support activities from ingress through EMU doffing. For suspected contamination 0:55 (1:10 if from ISS thruster) of consumables reqd. EVA tasks must be deferred to protect these consumables. Bakeout on SCU does not consume Metox/LiOH if helmet purge valve is open

12.1 (Cont)



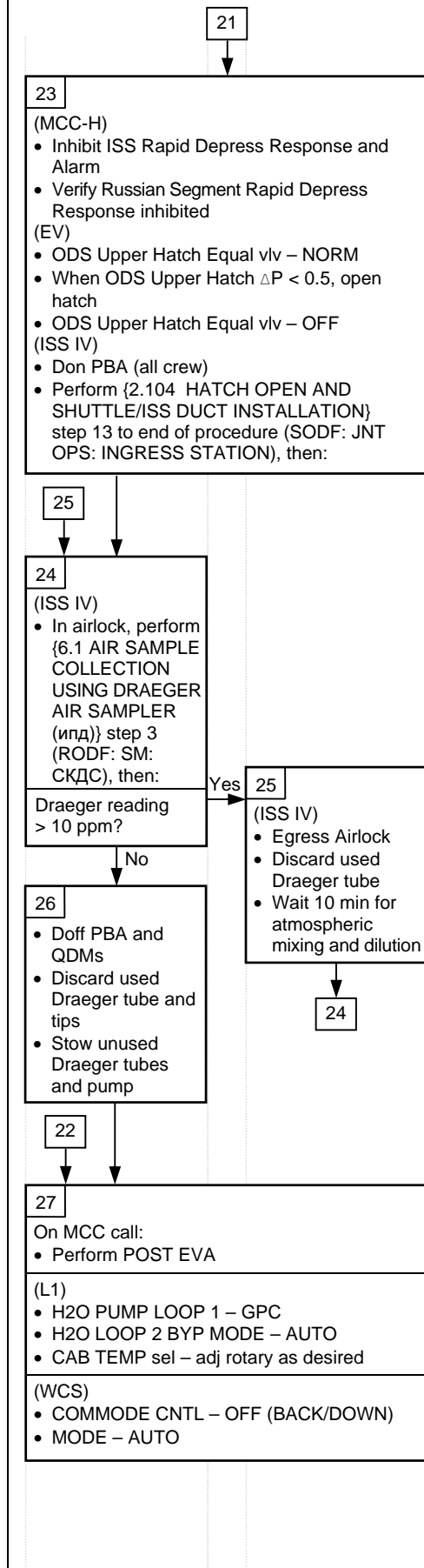
③

For ammonia or oxidizer only, if the contamination test passed at 5 psia, no further mixing is required. If the test failed and EMU consumables would not support an additional depress/repress cycle, atmospheric mixing with Booster Fan should be performed for 10 min to completely mix the airlock and crew module. Maximum dilution is approximately 12:1 (airlock only) or 7:1 (tunnel adapter). Dilution with ISS will further reduce concentration by 6:1 over 2 hr

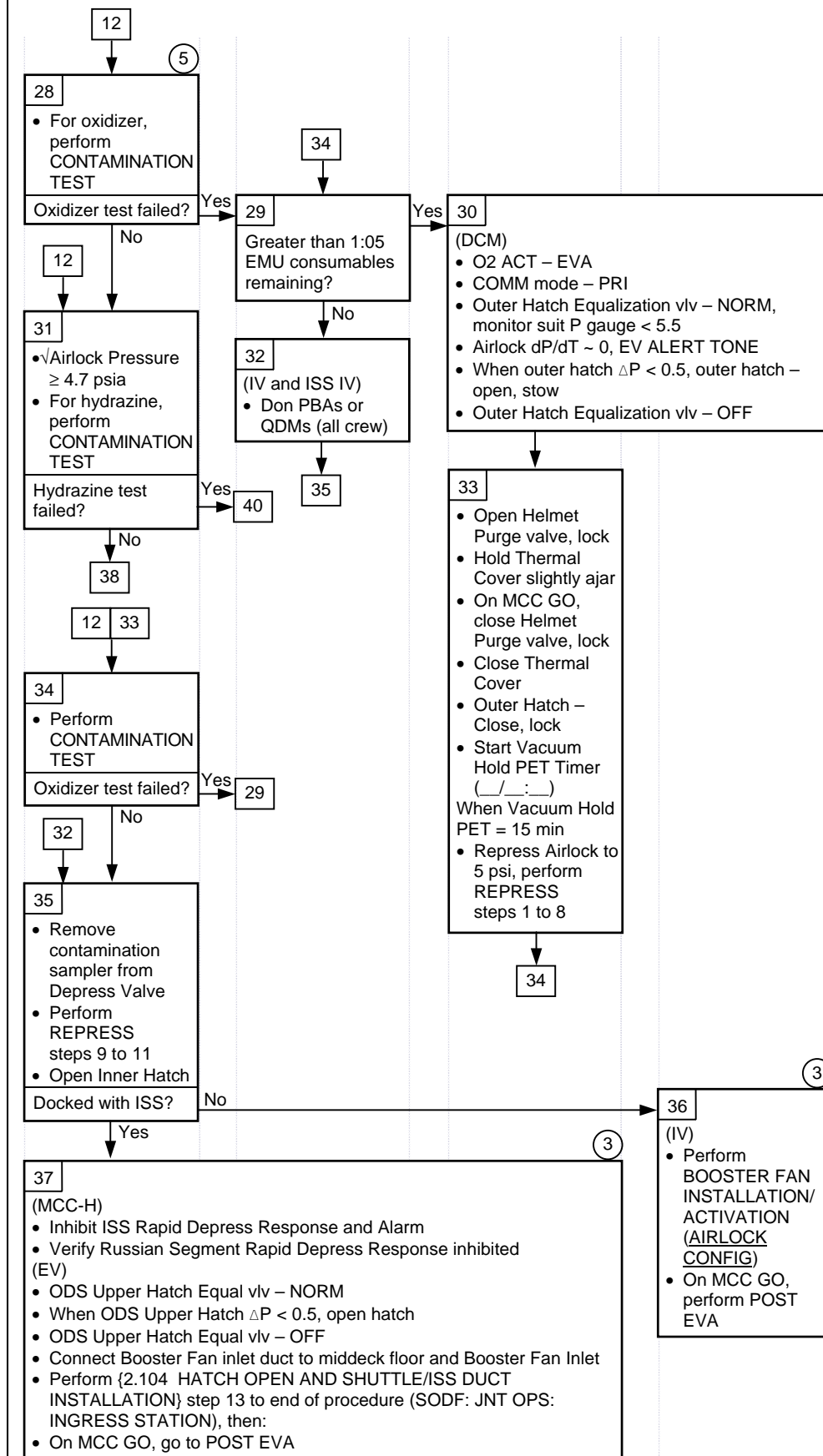
④

The WCS filter will reduce ammonia concentration by 63% every 60 min for a shuttle equivalent volume

12.1 (Cont)



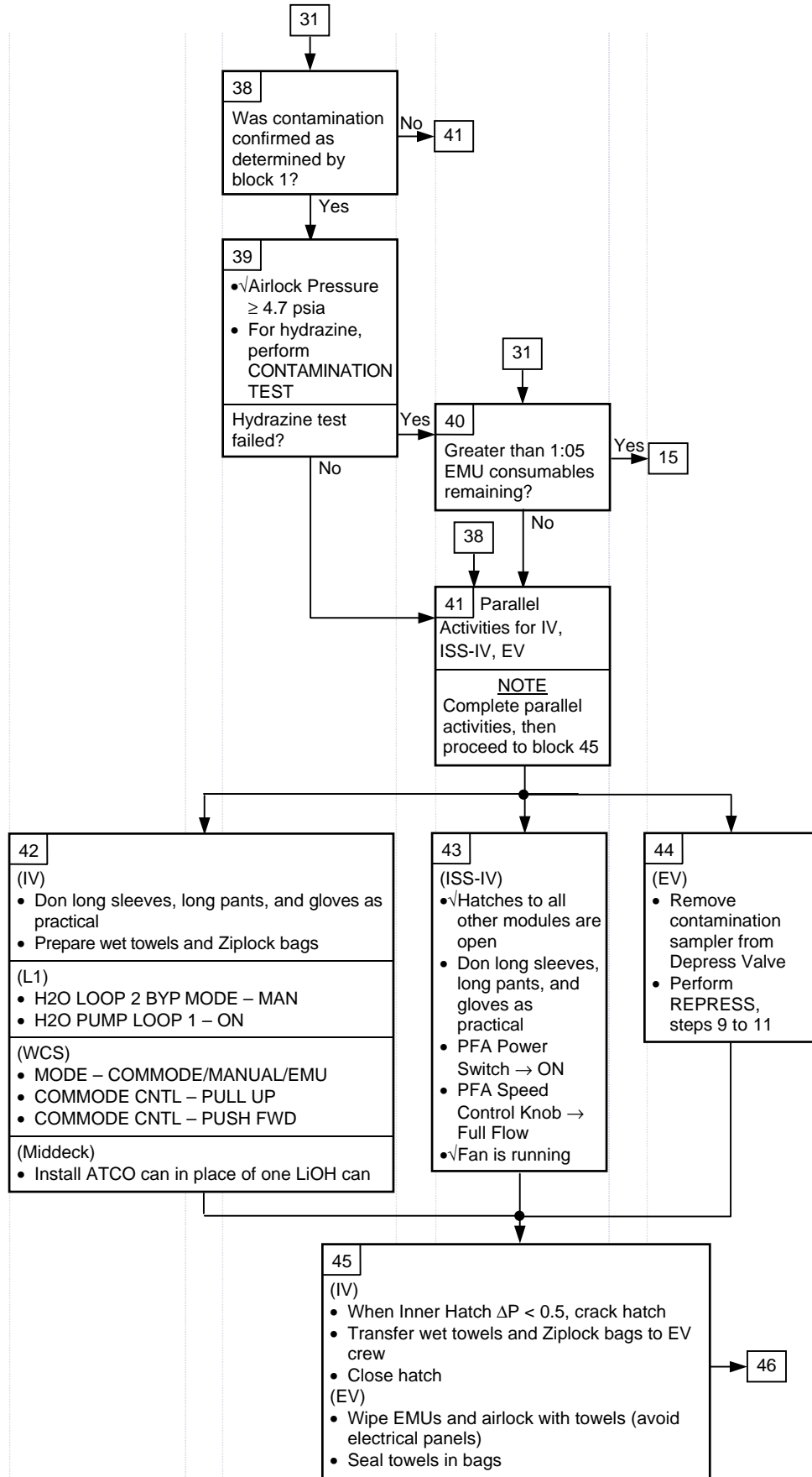
12.1 (Cont)



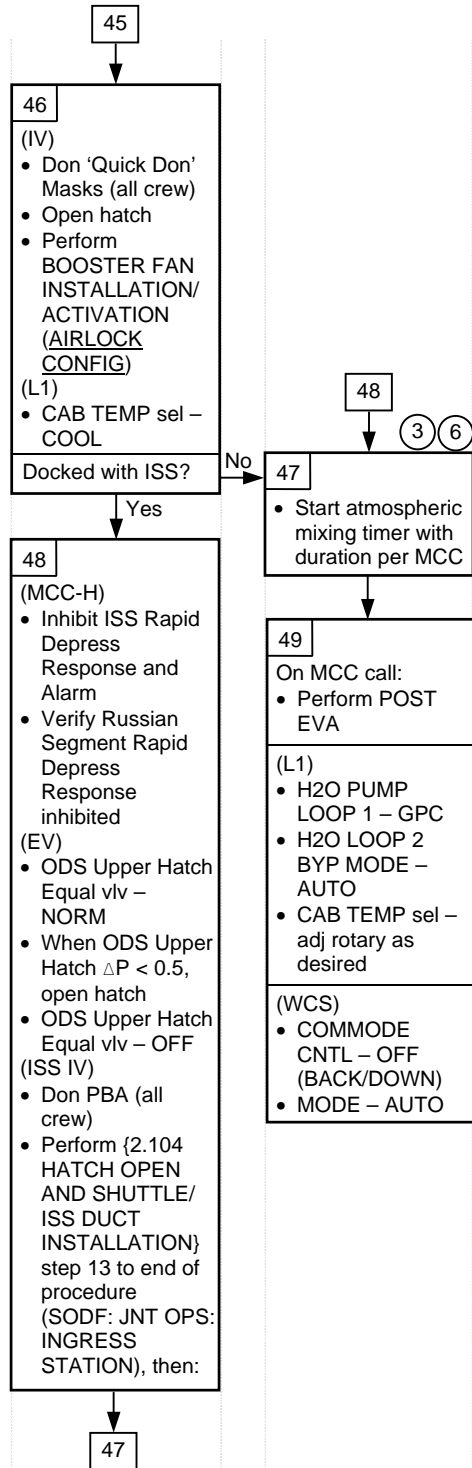
③ For ammonia or oxidizer only, if the contamination test passed at 5 psia, no further mixing is required. If the test failed and EMU consumables would not support an additional depress/repress cycle, atmospheric mixing with Booster Fan should be performed for 10 min to completely mix the airlock and crew module. Maximum dilution is approximately 12:1 (airlock only) or 7:1 (tunnel adapter). Dilution with ISS will further reduce concentration by 6:1 over 2 hr

⑤ On ISS, it is impossible to determine if a propulsion leak was fuel or oxidizer. Therefore, tests must be performed for both oxidizer and UDMH

12.1 (Cont)



12.1 (Cont)



③

For ammonia or oxidizer only, if the contamination test passed at 5 psia, no further mixing is required. If the test failed and EMU consumables would not support an additional depress/repress cycle, atmospheric mixing with Booster Fan should be performed for 10 min to completely mix the airlock and crew module. Maximum dilution is approximately 12:1 (airlock only) or 7:1 (tunnel adapter). Dilution with ISS will further reduce concentration by 6:1 over 2 hr

⑥

Each ATCO canister will reduce the hydrazine concentration by 63% every 90 min for a shuttle equivalent volume

CONTAMINATION TEST

To be performed in conjunction with 12.1 STS EVA DECONTAMINATION. It is performed with the external airlock at 5 psia following suspected hydrazine or oxidizer contamination

- EV
IV
1. √Inner hatch Equal vlv (two) – OFF
 2. Wait 30 sec for pressure stabilization
Record AIRLK P from EV DCM

	1	2	3
2. AIRLK P			

- EV AW82B 3. Attach STS Contamination Sampler to depress valve
AW18A 4. √LTG FLOOD (four) – ON
5. Go to appropriate chemical test steps below

AMMONIA CONTAMINATION TEST

6. Using RET, retrieve ammonia detector from Contamination Detection Kit
7. Verify Draeger tube color – yellow

* Use new tube if not proper color *

CAUTION

Minimize contact with fracture regions of Draeger tube. Minor glove RTV damage is possible, but protective pressure bladders and restraints unaffected

- AW82B 8. Using equipment hook of RET as a lever, break off both tether points on ammonia detector
9. Insert ammonia detector into STS Contamination Sampler with orientation that allows number scale to be read

WARNING

Precise sampling times are critical for accurate testing. IV should coordinate start of timer with opening of AIRLK DEPRESS valve

10. AIRLK DEPRESS vlv – 5
 11. Start timer (3:30 sampling time)
- When timer expired:
12. AIRLK DEPRESS vlv – CL

NOTE

If ammonia is present, Draeger tube will turn deep blue

- DCM 13. Compare AIRLK P to pressure in step 2
If $\Delta P \geq 0.1$ psi (indicates leak in sampling hardware):
14. To repress airlock to 5.0 psi, Inner hatch Equal vlv (one) – throttle NORM to OFF
 15. Go to step 1 to repeat test with new Draeger tube
 16. Determine test results based on table 1 and report to MCC

TABLE 1.- AMMONIA TEST PASS/FAIL CRITERIA

Reaction Line	Report Status	Assumed Concentration with 2x Factor of Safety
None seen	Passed	10 ppm
$0 < X < 2$	Passed	30 ppm
$2 < X < 5$	Failed	60 ppm
$5 < X < 25$	Failed	180 ppm

17. Continue 12.1 STS EVA DECONTAMINATION

OXIDIZER CONTAMINATION TEST

18. Using RET, retrieve nitrous fumes detector from Contamination Detection Kit

19. Verify Draeger tube color pale gray

* Use new tube if not proper color *

CAUTION

Minimize contact with fracture regions of Draeger tube. Minor glove RTV damage is possible, but protective pressure bladders and restraints unaffected

AW82B 20. Using equipment hook of RET as a lever, break off both tether points on nitrous fumes detector

WARNING

Precise sampling times are critical for accurate testing. IV should coordinate start of timer with opening of AIRLK DEPRESS valve

21. AIRLK DEPRESS vlv – 5

22. Start timer (15:00 sampling time)

When timer expired:

23. AIRLK DEPRESS vlv – CL

NOTE

If oxidizer present, Draeger tube will turn blue gray

DCM 24. Compare AIRLK P to pressure in step 2

If $\Delta P \geq 0.1$ psi (indicates leak in sampling hardware)

25. To repress airlock to 5.0 psi, Inner hatch Equal vlv (one) – throttle NORM to OFF

26. Go to step 1 to repeat test with new Draeger tube

27. Determine test results based on table 2 and report to MCC

TABLE 2.- OXIDIZER TEST PASS/FAIL CRITERIA

Reaction Line	Report Status	Assumed Concentration with 2x Factor of Safety
$X < 0.5$	Passed	1.5 ppm
$0.5 < X < 1$	Failed	3 ppm
$1 < X < 2$	Failed	6 ppm

28. Continue 12.1 STS EVA DECONTAMINATION

HYDRAZINE CONTAMINATION TEST

29. Retrieve hydrazine detector from Contamination Detection Kit

NOTE

Hydrazine detector is double bagged. Inner bag is not captive and should be constrained to prevent FOD

30. Tear open hydrazine detector packaging
Stow packaging in small trash bag
31. ✓ Initial coupon color – white
- AW82B 32. Insert hydrazine detector into STS Contamination Sampler
33. Helmet Lights – OFF

WARNING

Precise sampling times are critical for accurate testing. IV should coordinate start of timer with opening of AIRLK DEPRESS valve

34. AIRLK DEPRESS vlv – 5
35. Start timer (10:00 sampling time)
When timer expired:
 36. AIRLK DEPRESS vlv – CL
- DCM 37. Compare AIRLCK P to pressure in step 2
If $\Delta P \geq 0.2$ psi (indicates leak in sampling hardware)
 38. To repress airlock to 5.0 psi, Inner hatch Equal vlv (one) – throttle NORM to OFF
 39. Go to step 1 to repeat test with new hydrazine detector

NOTE

Hue and intensity of test coupon color change is proportional to hydrazine concentration. For shuttle thruster leaks, compare coupon to US Propellant (MMH) color scale. For ISS thruster leaks, compare coupon to Russian Propellant (UDMH) color scale

40. Determine test results based on table 3 and report to MCC

TABLE 3.- HYDRAZINE TEST PASS/FAIL CRITERIA

MMH	Report Status	Assumed Concentration with 2x Factor of Safety
No color change seen	Passed	28 ppb
Unexposed < X < 25 ppb	Passed	50 ppb
25 ppb < X < 50 ppb	Failed	100 ppb
50 ppb < X < 100 ppb	Failed	200 ppb
UDMH		
No color change seen	Passed	54 ppb
Unexposed < X < 50 ppb	Passed	100 ppb
50 ppb < X < 100 ppb	Failed	200 ppb
100 ppb < X < 300 ppb	Failed	600 ppb

41. Continue 12.1 STS EVA DECONTAMINATION

SAFER BATTERY CHANGEOUT (15 min)

1. Unstow new battery
- PM 2. Install Inhibitor
3. √MAN ISOL vlv – CL (up)
- HCM 4. √PWR – OFF
- PM 5. Remove T-Handle tool from lanyard while keeping Inhibitor installed on SAFER
6. Separate TMG Velcro on bottom of prop module to access battery
7. Loosen captive screws (eight) using 9/64-in Hex Wrench on T-Handle tool
8. Remove battery; disconnect battery umbilical connector
9. Stow used battery
10. Record new battery serial number (SAFER CHECKOUT RESULTS Cue Card)
Report old battery serial number and new stowage location to MCC as comm permits
11. Connect new battery umbilical connector; install battery
12. Tighten captive screws (eight)
13. Reattach TMG Velcro
14. Attach T-Handle tool to lanyard
15. Go to SAFER CHECKOUT

BENDS TREATMENT ADAPTER (BTA) INSTALLATION (IN-SUIT)

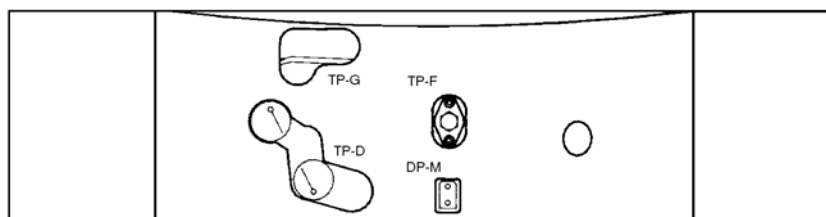
BTA PREP

- EMU
1. Unstow BTA with 3/8-in Wrench
 2. Cut/break TMG tacks (see 12-23)
 3. Unzip PLSS TMG (avoid pulling on antenna cable)
 4. Remove impact shield
 5. Disconnect hatch marked cable P3 (see 12-23); cut cable if reqd

NOTE

It may be necessary to extend the legs forward to access the test port in a pressurized EMU

6. Remove test port F plug on SOP using 3/8-in end of BTA Wrench (4-6 turns ccw) (see SECONDARY OXYGEN PACKAGE below)



SECONDARY OXYGEN PACKAGE

- BTA
7. Stow test port F plug (see 12-23) on BTA
 8. Unstow poppet keeper screw from BTA, temp stow in EMU Servicing Kit

BTA TREATMENT

9. √SCU connected to DCM
 10. Align BTA engage mark with PPRV mark
Connect BTA to PPRV (rotate BTA cw to hard stop to lock), √locked
 11. √EV-1(EV-2) O2 vlv – OP
 12. √EMU O2 ISOL vlv – OP
 13. √PWR – SCU
 14. √FAN – ON
 15. √COMM mode – HL, vol as reqd
 16. DISP – PRO until **BTA?OFF** displayed
 - YES (hold for 2 sec), verify **ENABLE BTA?** displayed
 - YES (hold for 2 sec), verify **BTA ENABLED** displayed
- If biomed reqd:
17. Perform EVA COMM CONFIG (EVA PREP), steps 2-8
 18. Comm FREQ – LOW
COMM mode – PRI
19. √FAN SEP same as HOSE BLOCK
 20. MODE – COMMODE/MANUAL/EMU, posn guard over sw (√airflow, WCS ON It on)
 21. √EMU 1(2) H2O SPLY – CL (tb-CL)
 22. EMU 1(2) H2O SPLY WASTE reg – MAN OP
 23. EMU 1(2) H2O WASTE – OP (tb-OP) (until H2O WP < 7 and stable for ~1 min)
 24. EMU 1(2) H2O WASTE – CL (tb-CL)
 25. EMU 1(2) H2O SPLY WASTE reg – REGULATING
 26. MODE – AUTO (√WCS ON It off)
 27. √STATUS: **SUIT P** = 4.2-4.4
 28. O2 ACT – OFF (until SUIT P stabilizes)

NOTE

Suit pressure will nominally increase when O2 actuator taken to OFF. Suit P = H2O GP when O2 ACT – OFF. For actual suit P > 5.9 psi, suit P can only be directly read as H2O GP; actual suit P = 4.7 to 5.5 psi above BTA gauge pressure

CAUTION

If BTA gauge pressure increases while O2 ACT – PRESS, immediately set O2 ACT – OFF to prevent a hazardous condition; contact MCC

29. O2 ACT – PRESS (for 15 sec), √BTA gauge not increasing when O2 ACT – PRESS
30. O2 ACT – OFF (until H2O GP stable)
31. √STATUS: H2O GP
DISP – YES (hold for 2 sec) to lock parameter; re-lock every 5 min
32. Repeat steps 29,30 until H2O GP = 6.0 psid and stable on DCM display with O2 ACT – OFF

As reqd to maintain H2O GP = 6.0 psid:

33. Repeat steps 29,30

NOTE

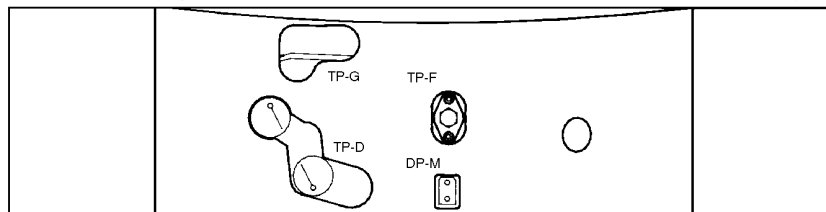
Initial treatment will be at 6 psid for Cuffs 2 and 3 and will be increased to 8 psid if symptoms do not resolve. Initial treatment for Cuff 4 will be 8 psid

34. Contact Surgeon for treatment length and changes in treatment pressure

BENDS TREATMENT ADAPTER (BTA) INSTALLATION (POST SUIT DOFFING)

BTA PREP

- EMU
1. Unstow BTA with 3/8-in Wrench
 2. Cut/break TMG tacks (see 12-23)
 3. Unzip PLSS TMG (avoid pulling on antenna cable)
 4. Remove impact shield
 5. Disconnect hatch marked cable P3, cut cable if reqd (see 12-23)
 6. Remove test port F plug on SOP using 3/8-in end of BTA Wrench (4-6 turns ccw) (see SECONDARY OXYGEN PACKAGE below)



SECONDARY OXYGEN PACKAGE

- BTA
7. Stow test port F plug (see 12-23) on BTA
- If LiOH replacement reqd by MCC:
8. Unstow new LiOH cartridge
 9. Remove used LiOH cartridge
 10. Holding new LiOH cartridge w/aluminum plate serial number facing self, remove caps (left first), √O-ring seals for damage, install LiOH (attach Velcro retainer strap)
 11. Install caps on used LiOH cartridge
Tape an X on used LiOH cartridge and stow

BTA TREATMENT

12. √SCU connected to DCM
 13. Unstow Poppet Keeper Screw from BTA
 14. Open Positive Pressure Relief Valve (PPRV) using BTA poppet keeper (thread cw to hard stop, pull, tighten nut) (see 12-23)
 15. Align BTA engage mark with PPRV mark
Connect BTA to PPRV (rotate BTA cw to hard stop to lock); √locked
 16. Don MAG, LCVG, biomed
 17. Fill drink bag from galley, remove gas and insert drink bag in restraint bag
 18. Install Drink Bag Restraint Bag in HUT and dispose of fill tool in wet trash
 19. √EV-1(EV-2) O2 vlv – OP
 20. √EMU O2 ISOL vlv – OP
 21. PWR – BATT
- AW82B
- MD(flr)
- DCM

CAUTION
EMU must be on BATT pwr when
airlock pwr supply turned on

- AW18H
22. PWR/BATT CHGR EMU 1(2) MODE – PWR
BUS SEL – MNA(MNB)
- DCM
23. PWR – SCU
 24. √Waist ring – op
 25. Don LTA (attach donning handles as reqd)
 26. √Suit arms aligned
 27. √Wrist disconnects – op
 28. Don thumb loops
 29. √Biomed connector outside of HUT
 30. Don HUT

- 31. Release thumb loops
 - 32. √Suit arms aligned
 - 33. Don comm cap
 - DCM 34. √COMM mode – HL, vol as reqd
If biomed reqd:
 - DCM 35. Perform EVA COMM CONFIG (EVA PREP), steps 2-8
 - DCM 36. Comm FREQ – LOW
COMM mode – PRI
 - 37. Connect biomed to elec harness
 - 38. Connect LCVG to multiple water connector, √locked
 - 39. √Thermal cover clear of waist ring
 - 40. Waist ring – engage posn
 - 41. Connect waist ring to HUT, √locked
 - 42. Wrist rings – engage posn
 - 43. Don EV gloves, √locked
 - 44. √Mike boom posn
 - DCM 45. FAN – ON
 - 46. √Elec harness clear of neck ring
 - 47. Don helmet, √locked
 - 48. √Helmet purge vlv – cl, locked
 - 49. √PURGE vlv – op
 - 50. O2 ACT – PRESS, begin purge clock (12 min)
 - WCS 51. √FAN SEP same as HOSE BLOCK
 - 52. MODE – COMMODE/MANUAL/EMU, posn guard over sw (√airflow, WCS ON It on)
 - AW82D 53. √EMU 1(2) H2O SPLY – CL (tb-CL)
 - AW82H 54. EMU 1(2) H2O SPLY WASTE reg – MAN OP
 - AW82D 55. EMU 1(2) H2O WASTE – OP (tb-OP)
- When N2 purge time = 12 min:
- AW82H 56. EMU 1(2) H2O WASTE – CL (tb-CL)
 - 57. EMU 1(2) H2O SPLY WASTE reg – REGULATING
- WCS 58. MODE – AUTO (√WCS ON It off)
 - DCM 59. PURGE vlv – cl (dn)
 - 60. √STATUS: SUIT P = 4.2-4.4
 - 61. DISP – PRO until BTA?OFF displayed
 - YES (hold for 2 sec), verify ENABLE BTA? displayed
 - YES (hold for 2 sec), verify BTA ENABLED displayed

NOTE

Suit P will increase about ~.5 psi each time O2 ACT – OFF

- 62. O2 ACT – OFF (until Suit P incr stabilizes)
- 63. O2 ACT – PRESS (for 15 sec)
- 64. Repeat steps 62,63 until Suit P = 6.0 psig on BTA gauge

NOTE

BTA relief valve relieves at 7.95-8.45 psig

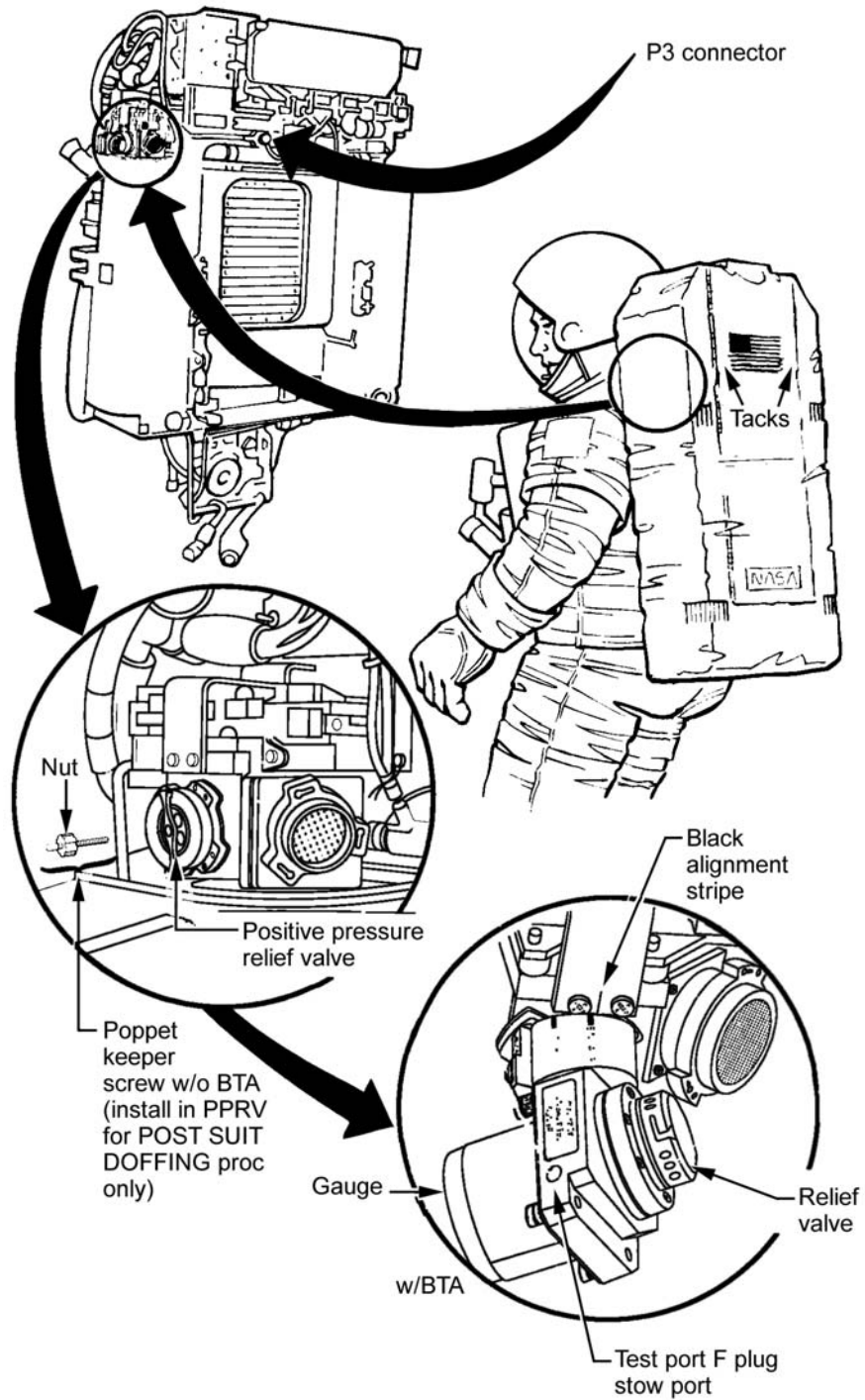
As reqd to maintain Suit P = 6.0 psig:

- 65. Repeat steps 62,63

NOTE

Initial treatment will be at 6 psid for Cuffs 2 and 3 and will be increased to 8 psid if symptoms do not resolve. Initial treatment for Cuff 4 will be 8 psid

- 66. Contact Surgeon for treatment length and changes in treatment pressure



BTA LOCATION ON EMU

EMU RESIZE (30 min)

NOTE

Procedures written for arm, thigh, and boot disconnects. Arm, thigh, and boot sizing rings are not interchangeable and cannot be stacked. See figures below and next page as reference during procedure

Old component(s)/ EMU

1. Identify component(s) to be installed per appropriate resize matrix
 2. Peel back TMG from disconnect
- If replacing arm components:
3. ✓ REBA sw – OFF (toward left arm of suit)
 4. Disconnect lower arm power harness from gloves and upper arm

WARNING

Threads on sizing rings and arm/leg/boot segments have sharp edges. Avoid contact with skin and suit bladder

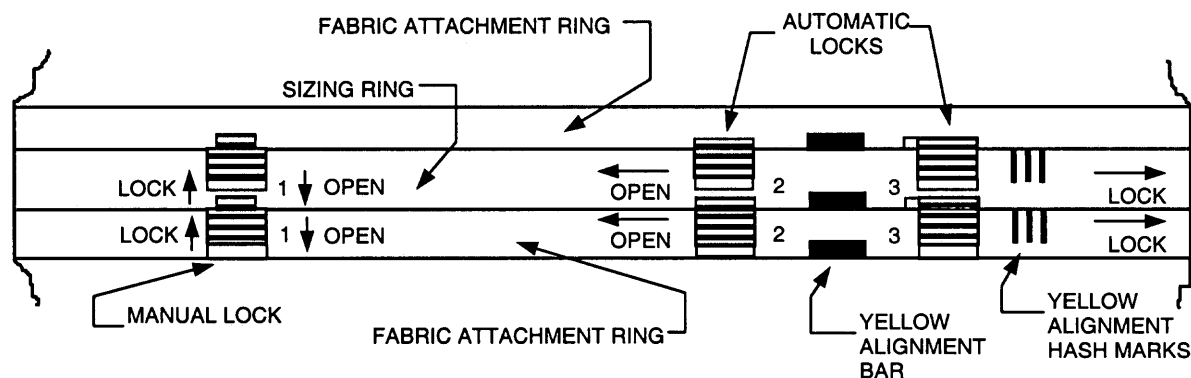
5. Lock 1 – OPEN (on arm, lock may reengage due to bladder)
6. Lock 2 – hold OPEN while turning ring to engage lock 2 OPEN against disconnect
7. Lock 3 – hold OPEN while turning ring in OPEN direction
8. Demate segment/ring
9. Install protective caps on ends of components; place rings in protective pouches
10. Repeat steps 2-9 as reqd

New component(s)/ EMU

11. ✓ Proper size located on bladder by disconnect
12. ✓ All seals, threads and wipe with lint-free wipe (EMU Servicing Kit)
13. Lock 1 – OPEN (lock may reengage due to bladder on arm)
14. Align new component yellow hash marks with yellow bar on disconnect
15. Turn rings in LOCK direction
16. ✓ Lock 2,3 – locked
17. Lock 1 – LOCK
18. ✓ Cam adjustments (4 per segment) per appropriate resize matrix
19. If lower arm replaced, connect lower arm power harness to upper arm
20. Remate TMG covering disconnect
21. Repeat steps 11-20 as reqd

Old component(s)/ EMU

22. Stow replaced component(s)



DISCONNECT IN LOCKED POSITION

EMU RESIZE (Cont)

ARM CAM ADJUSTMENT

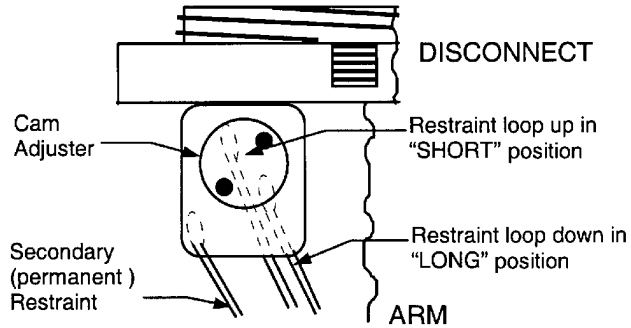
(0.25-in per cam)

NOTES

Cam Adjuster only rotates in one direction.

Cam Adjuster should click and lock in the full SHORT and full LONG positions.

Cam positions/arms must be symmetric; likely minimum of four (4) cams to be adjusted



WAIST CAM ADJUSTMENT

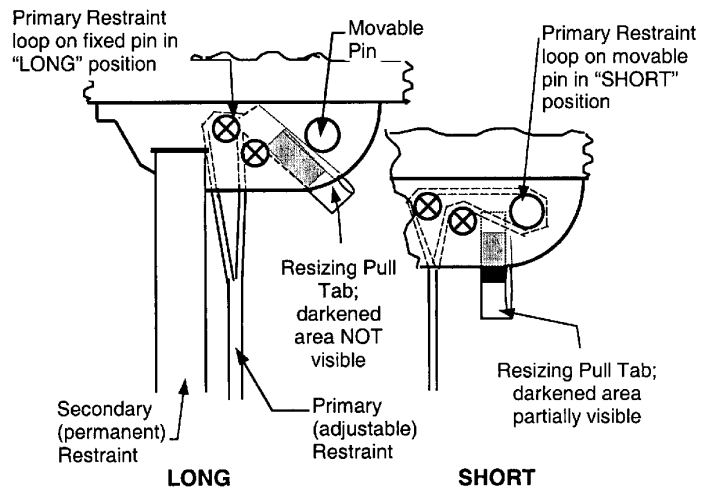
(1.0-in per cam)

NOTES

After adjusting, verify that restraint is routed around proper pin; that material is not damaged, twisted or pinched; and that movable pin is fully inserted.

With restraint in LONG position, the darkened area on Resizing Pull Tab should NOT be easily visible.

With restraint in SHORT position, the darkened area on Resizing Pull Tab should be easily visible.



Cam positions must be symmetric; minimum of two (2) cams to be adjusted

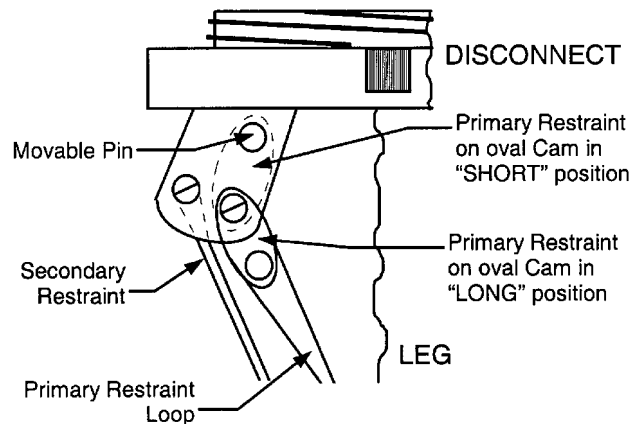
LEG CAM ADJUSTMENT

(0.5-in per cam)

NOTE

After adjusting, verify that restraint is routed around the oval cam; that material is not damaged, twisted or pinched; and that Movable Pin is fully inserted.

Cam positions/legs must be symmetric; likely minimum of four (4) cams to be adjusted



CAUTION

In SHORT position, the Movable Pin must be inserted thru oval cam, not just thru the restraint loop

In LONG position, the restraint must NOT be around the Movable Pin; verify that oval cam and restraint are down

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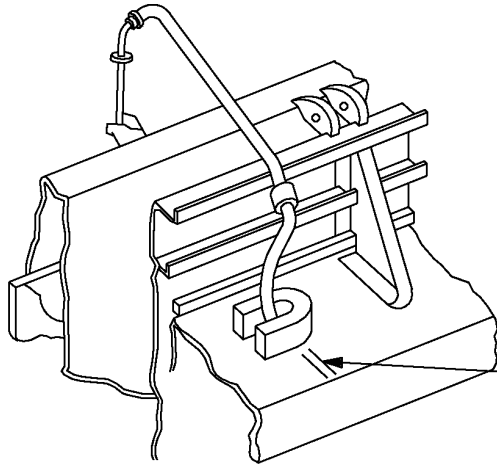
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ORBITER CONTINGENCY EVA

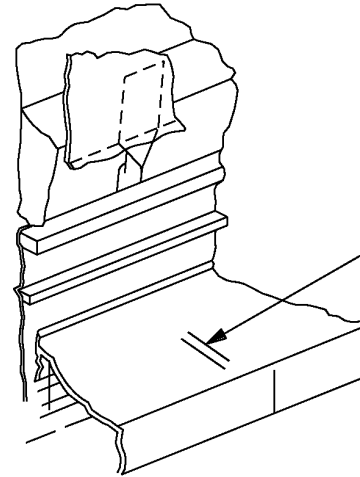
PAYLOAD BAY EVA NOMENCLATURE	14-2
RMS/PRLA CONTINGENCY EVA.....	14-3
96 BOLT PRE-EVA TOOL CONFIG	14-13
EVA TIMELINE.....	14-14
CAPTURE LATCH MANUAL RELEASE (ODS/PMA)	14-19
96 BOLT EVA LAYOUT	14-21
PLBD LATCH TOOL PLACEMENT WITH DUAL LATCH GANG FAILURES	14-22

ORB CONT
EVA

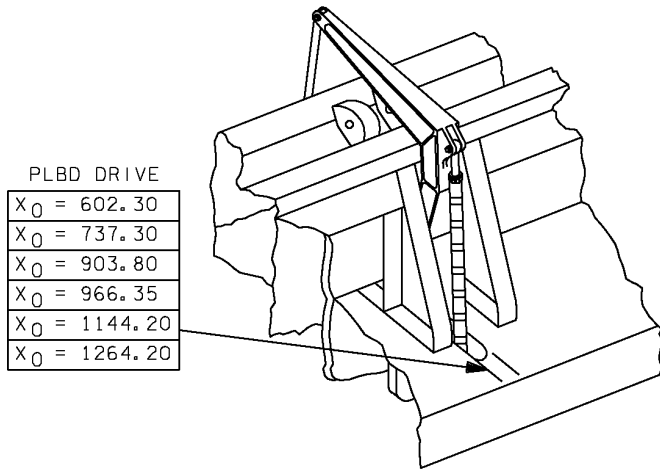
PAYLOAD BAY EVA NOMENCLATURE



FREON LOOP CONNECTION
 $X_0 = 839.36$
 $X_0 = 1198.00$



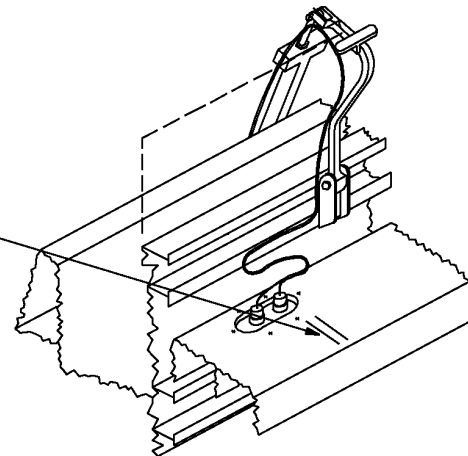
RADIATOR	
HINGE	ACTUATORS
	$X_0 = 611.68$
$X_0 = 614.50$	
$X_0 = 680.50$	$X_0 = 725.60$
$X_0 = 745.50$	
$X_0 = 774.50$	$X_0 = 794.95$
$X_0 = 857.30$	$X_0 = 906.80$
$X_0 = 927.00$	



PLBD DRIVE
 $X_0 = 602.30$
 $X_0 = 737.30$
 $X_0 = 903.80$
 $X_0 = 966.35$
 $X_0 = 1144.20$
 $X_0 = 1264.20$

ELECTRICAL CROSSOVER

$X_0 = 725.60$
 $X_0 = 794.95$
 $X_0 = 863.31$
 $X_0 = 1019.75$
 $X_0 = 1084.75$
 $X_0 = 1214.25$



9466. ART 1

RMS/PRLA CONTINGENCY EVA

FOR RMS/PRLA FAILURES:

<u>PRE EVA RMS CONFIG</u> [1]	
IV	If MRL fails to latch:
A8L	√RMS R-F-L tb (three) – gray √RMS tb – STO Go to RMS TIEDOWN [4]
A8L	If MPM fails to stow(deploy): √RMS RETEN LAT – LAT (tb-LAT) √MPMs stowed(deployed) as far as possible Go to MPM STOW/DEPLOY [5]
	If Joint fails: Position RMS for easy striker bar access Go to RMS JOINT ALIGN [6]

<u>PRE EVA EE/GF CONFIG</u> [2]	
IV	A8U BRAKES – ON (tb-ON) EE MODE – OFF
A8L	RMS SEL – OFF Go to RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE [8]

<u>PRE EVA PRLA CONFIG</u> [3]	
IV	MA73C:C cb MCA PWR AC1 3Φ MID 1 – op :D AC2 3Φ MID 3 – op
R13L	PL BAY MECH PWR 1,2 (two) – OFF
A6U	PL RETEN LOGIC PWR SYS 1,2 (two) – OFF LAT (five) – OFF Go to PRLA OPEN/CLOSE [9]

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

RMS TIEDOWN 4

IV If MRL fail to latch – monitor EV1 and EV2

Refer to RMS TIEDOWN figure, following page, as reqd

RMS TIEDOWN

TOOL BOX – PRDs (2), EVA TRASH BAG

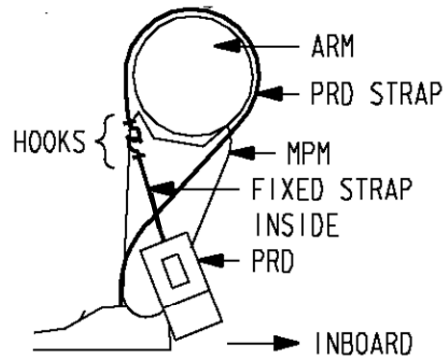
IFM – 9/64-in ALLEN WRENCH (AW)

ELBOW – PRD aft of MPM, peel blanket (fwd of MPM) toward EE; feed hook under cable harness (if reqd, remove cable harness clamp bolt with AW, bend clamp out of way), adjust strap as far fwd as possible

WRIST – PRD aft of MPM, strap rests just fwd of pitch joint opening

END EFFECTOR – PRD fwd of MPM, peel blankets aft and fwd, strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs

1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug, (14 full strokes reqd)
4. ✓Strap in correct arm location, ratchet tight
5. Reattach blankets



NOT IN EV CUFF

41

03/20/06

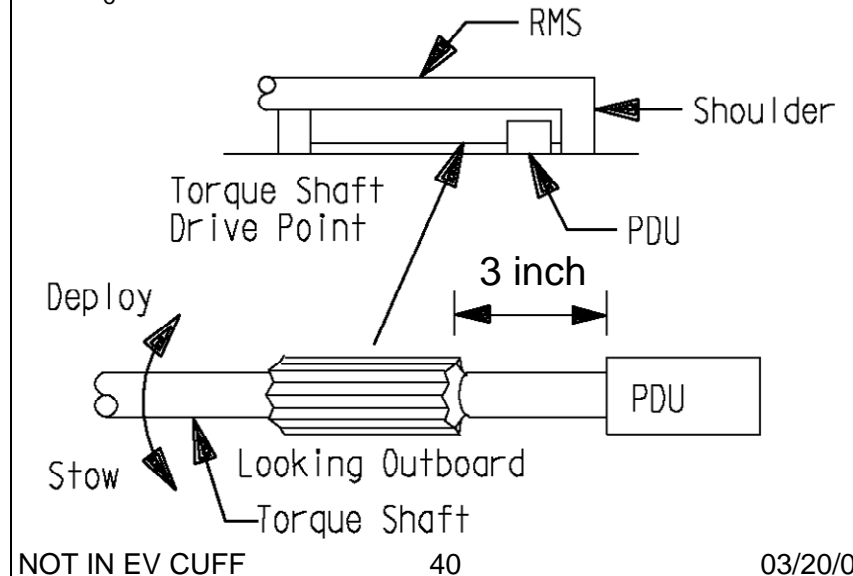
MPM STOW/DEPLOY 5

IV1 If MPM fail to stow/deploy, monitor EV1 and EV2, then:

MPM STOW/DEPLOY

TOOL BOX – MPM WRENCH

1. Rotate torque shaft (8 revs) until MPMs are stowed/deployed, $X_0=693$



NOT IN EV CUFF

40

03/20/06

IV

A8L

When MPMs in stow(deploy) position:

✓RMS tb – STO(DPY)

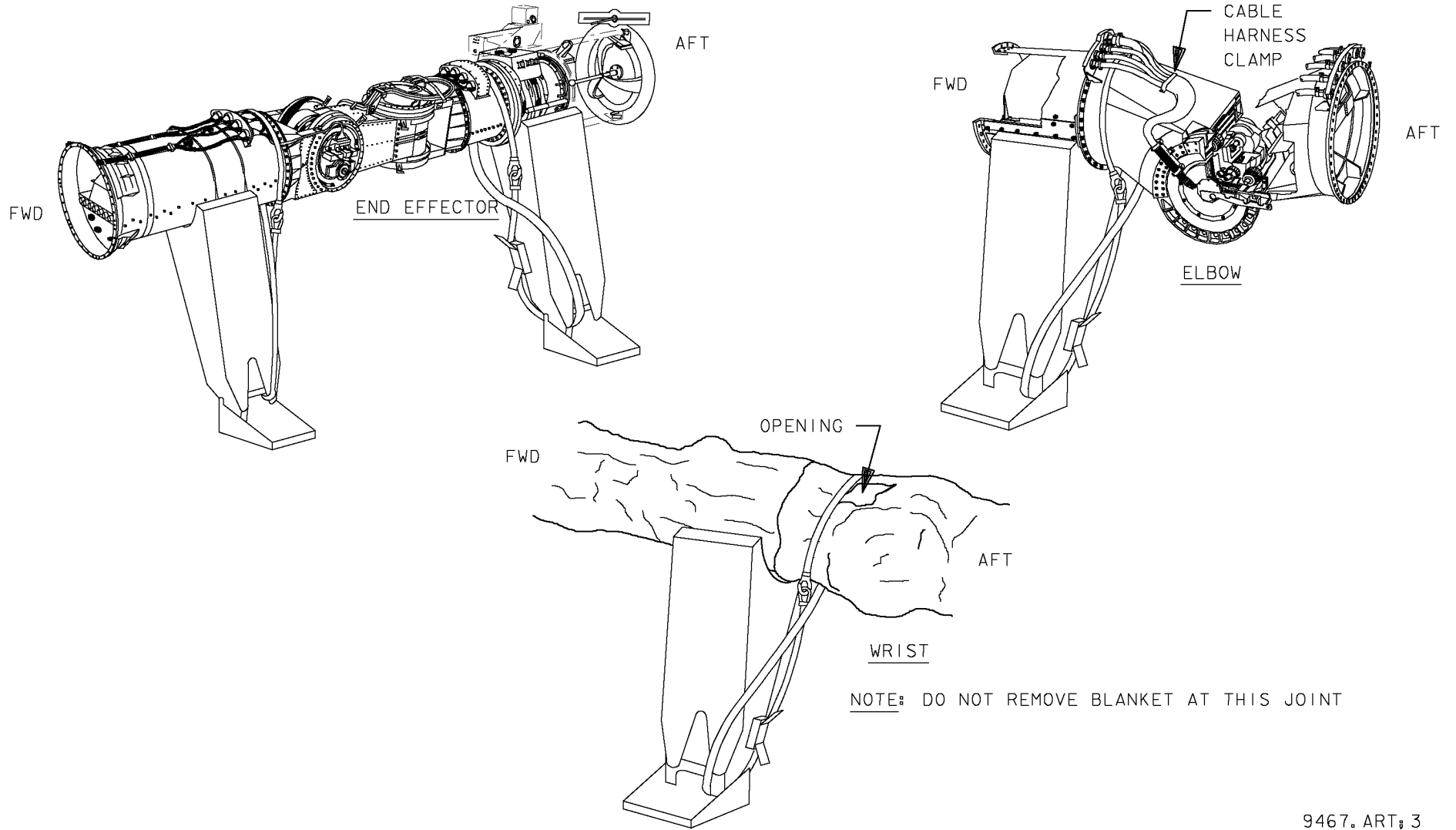
or

4: SM 94 PDRS CONTROL

✓RMS STO/DPY

11 00 (00 11)

RMS/PRLA CONTINGENCY EVA (Cont)

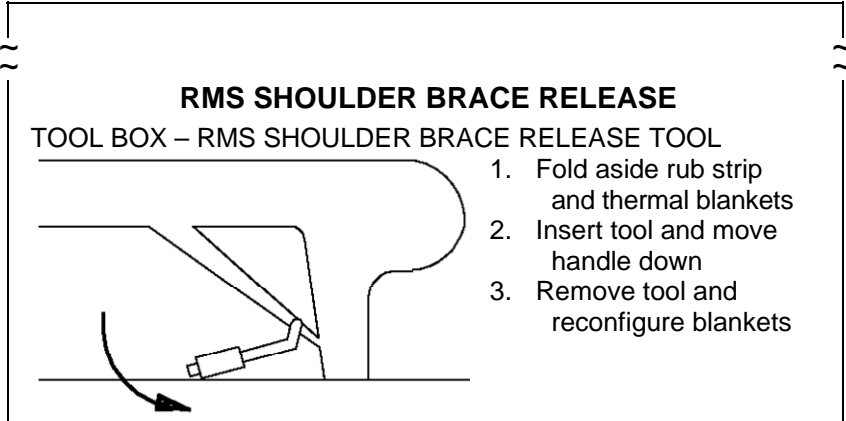


RMS TIEDOWN

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

RMS JOINT ALIGN 6	
IV	If Joint Fail – reposition RMS as reqd for RMS rope attachment – monitor EV1 and EV2
RMS JOINT ALIGN	
TOOL BOX – ADJ TETHERS, SNATCH BLOCKS (2), RMS ROPE REEL	
	<ol style="list-style-type: none"> 1. Attach RMS rope around end effector under handrail. Translate to avoid wrapping rope around RMS 2. Attach snatch block(s) to handrail(s) and route rope as reqd
IV	<ol style="list-style-type: none"> 3. Reposition RMS as required for cradling 4. Pull RMS down into MPMs 5. Perform final positioning by hand to allow MRLs to latch
~ ~ ~	
NOT IN EV CUFF 39 03/20/06	
IV	<p>When RMS ready to latch:</p> <p>R13L PL BAY MECH PWR SYS (two) – ON</p> <p>A8L RMS RETEN LAT – LAT (tb-LAT 18 sec max) – OFF</p> <p>If MPMs deployed:</p> <p>√Elbow Camr in aligned posn: Pan 90° from X-AXIS Tilt per DECAL</p> <p>A8L RMS – STO (tb-STO, 68 sec max) – OFF</p> <p>A8U BRAKES – ON (tb-ON)</p> <p>R13L PL BAY MECH PWR SYS (two) – OFF</p>

RMS SHOULDER BRACE RELEASE 7	
IV	A8 √RMS SELECT – OFF
RMS SHOULDER BRACE RELEASE	
TOOL BOX – RMS SHOULDER BRACE RELEASE TOOL	
	<ol style="list-style-type: none"> 1. Fold aside rub strip and thermal blankets 2. Insert tool and move handle down 3. Remove tool and reconfigure blankets
	
NOT IN EV CUFF 39 03/20/06	

RMS/PRLA CONTINGENCY EVA (Cont)

FOR RMS/PRLA FAILURES (Cont):

RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE 8

RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE

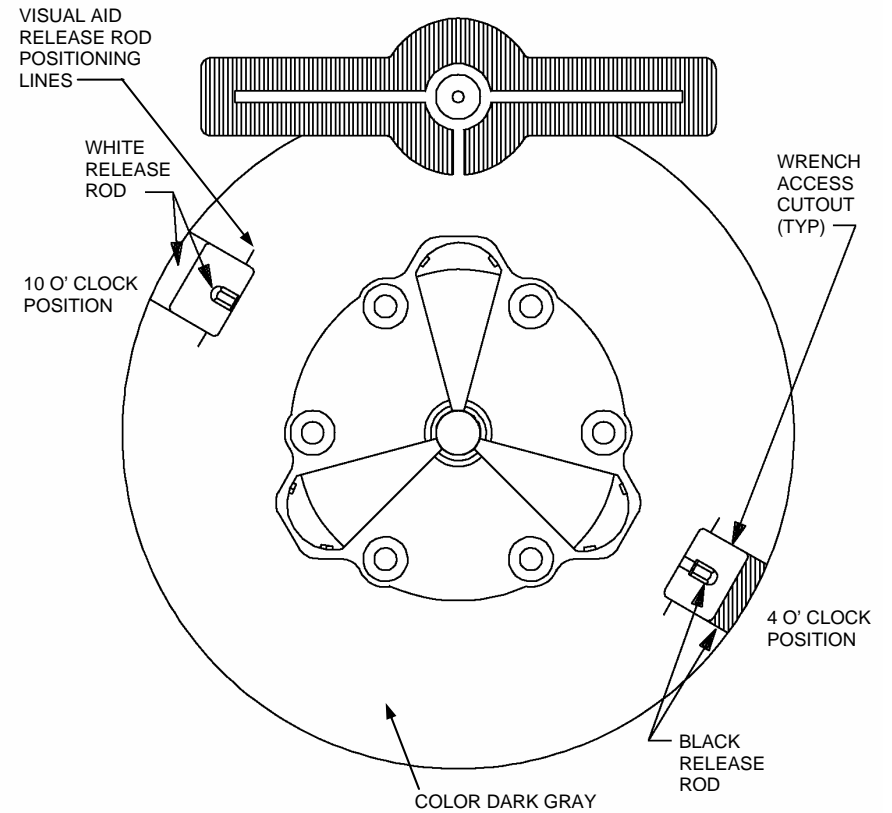
AIRLOCK – JETTISON STOWAGE BAG
TOOL BOX – 1/2-in BOX RATCHET, VELCRO/TAPE

- EV**
1. Rotate white release rod ccw to hard stop (32 strokes of 90 deg)
 2. Rotate black release rod cw to hard stop (32 strokes of 90 deg – shaft will release from grapple fixture)
 3. Clear worksite for RMS powerdown
 4. Tape end of shaft to restrain slug within shaft
 5. Cover end effector with jettison stowage bag to restrain grapple shaft

NOT IN EV CUFF

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03/20/06



RMS/PRLA CONTINGENCY EVA (Cont)

EFGF GRAPPLE SHAFT RELEASE

Tools Reqd:
1/2-in Box Ratchet, EVA Probe (PSA),
Jettison Stowage Bag (Airlock),
Spare Grapple Shaft w/Transfer Bag
(if reqd, Airlock)

- EV
1. Perform visual inspection of EE/GF interface to determine possible cause of failure
 2. Remove tee pull (~10 lb)
 3. Rotate release rod cw (break out < 20 ft-lb, running < 11 ft-lb) to hard stop (~90 strokes of 70 deg)

WARNING
If payload not restrained, rotation of
release rod after grapple shaft release
may impart movements to payload

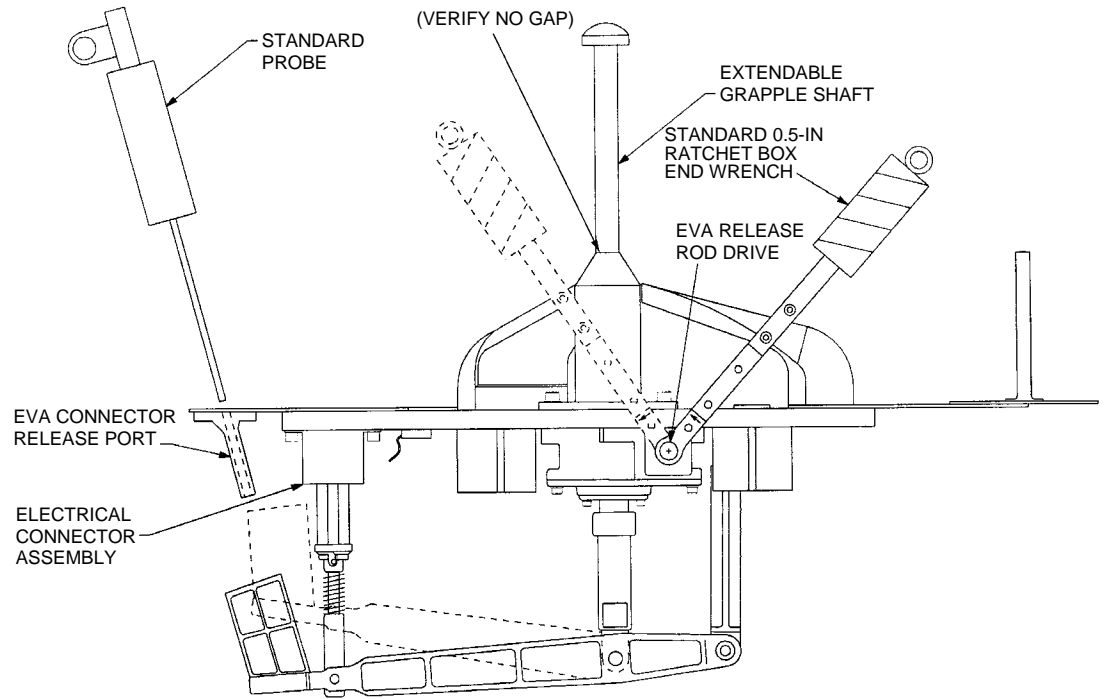
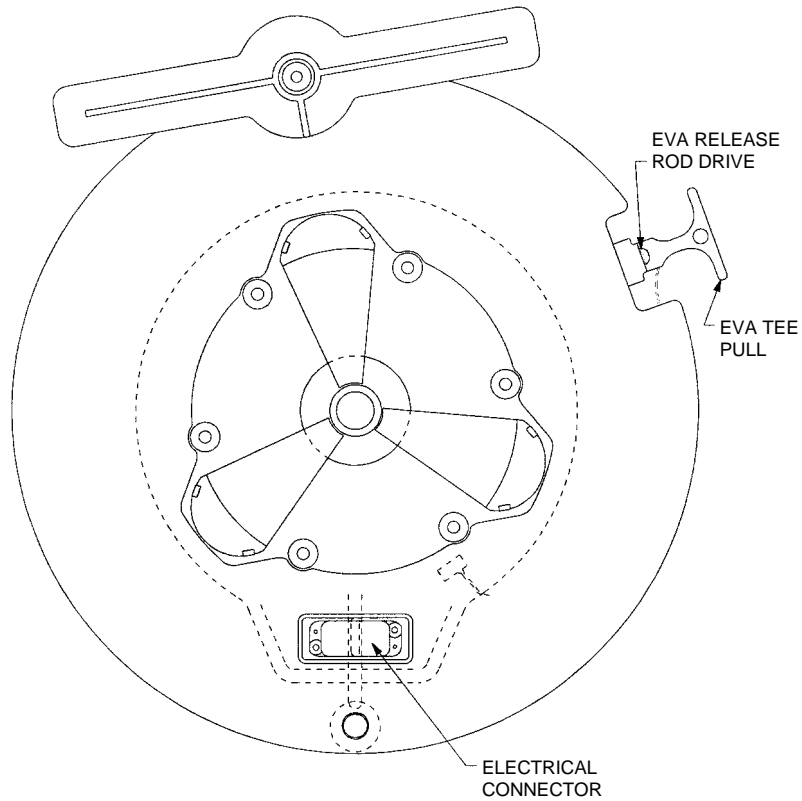
- IV
EV
4. ✓ Electrical connector disconnected
 5. If electrical connector not disconnected, insert probe into connector release port ~5.25 in for full release
- IV
EV
6. Clear worksite for RMS cradle
 7. Perform RMS POWERDOWN (PDRS OPS)
 8. Cover end effector with jettison stowage bag to restrain grapple shaft

SPARE SHAFT REPLACEMENT (If reqd)

- EV
9. Rotate release rod cw to hardstop then rotate ccw five strokes of ~70 deg (at least one full rev reqd). This will insure that grapple shaft can be released for future failures
 10. Insert spare shaft (~5 lb to overcome ball detent) using alignment pin and guide
 11. Rotate release rod ccw to hardstop (~90 strokes of ~70 deg), apply slight axial pressure to grapple shaft for initial rotations. This is required to aid in engagement of Acme threads

If grapple shaft not engaged after four revs of release rod, repeat steps 9-11
 12. Verify no gap between grapple shaft shoulder and grapple fixture cone. If gap is visible, release shaft and repeat insertion procedures
 13. Replace tee pull

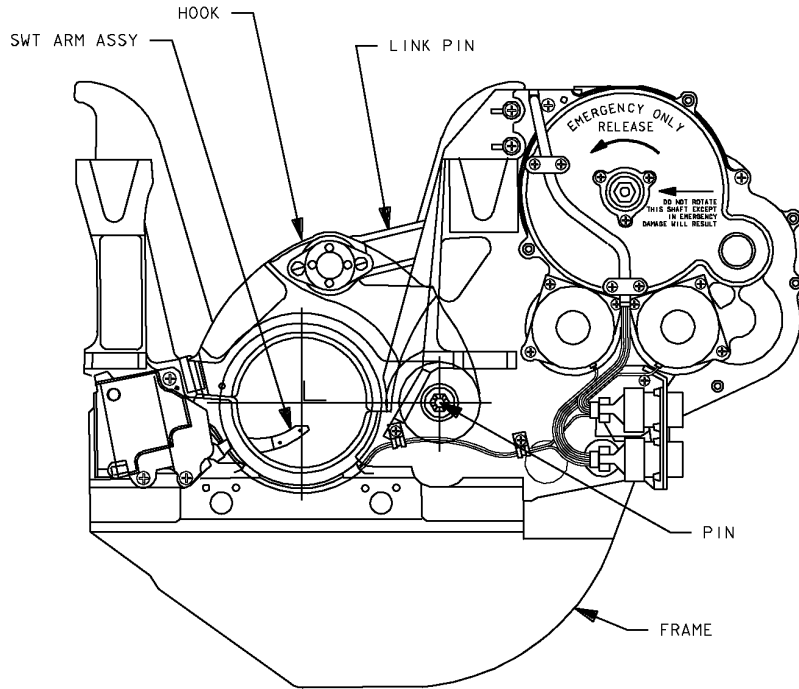
RMS/PRLA CONTINGENCY EVA (Cont)



ELECTRICAL FLIGHT GRAPPLE FIXTURE

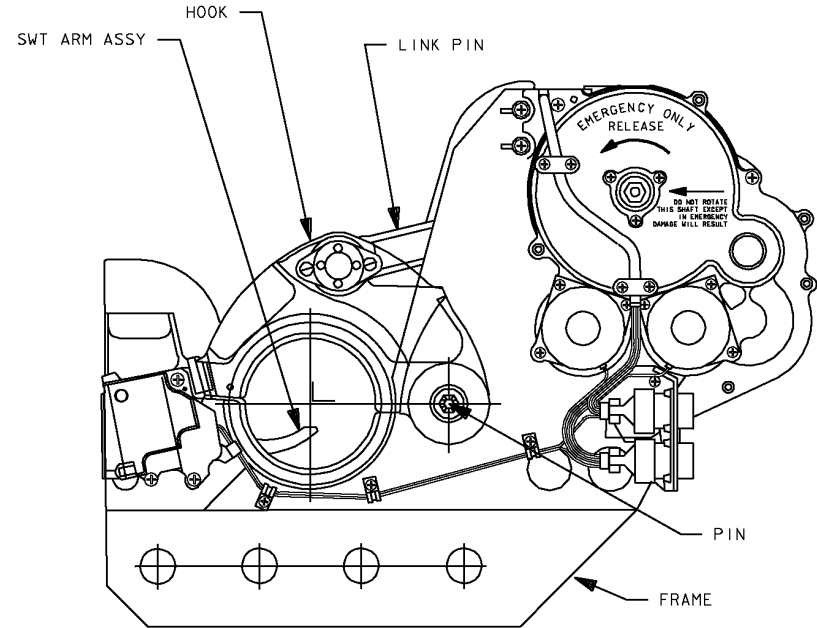
RMS/PRLA CONTINGENCY EVA (Cont)

In-board end of shaft has yellow marks.
Not aligned indicates motor disengaged



LWLL/MWLL/SMWLL

LIGHTWEIGHT LONGERON LATCH/
MIDDLEWEIGHT LONGERON LATCH/
SUPER MIDDLEWEIGHT LONGERON LATCH



MMWL

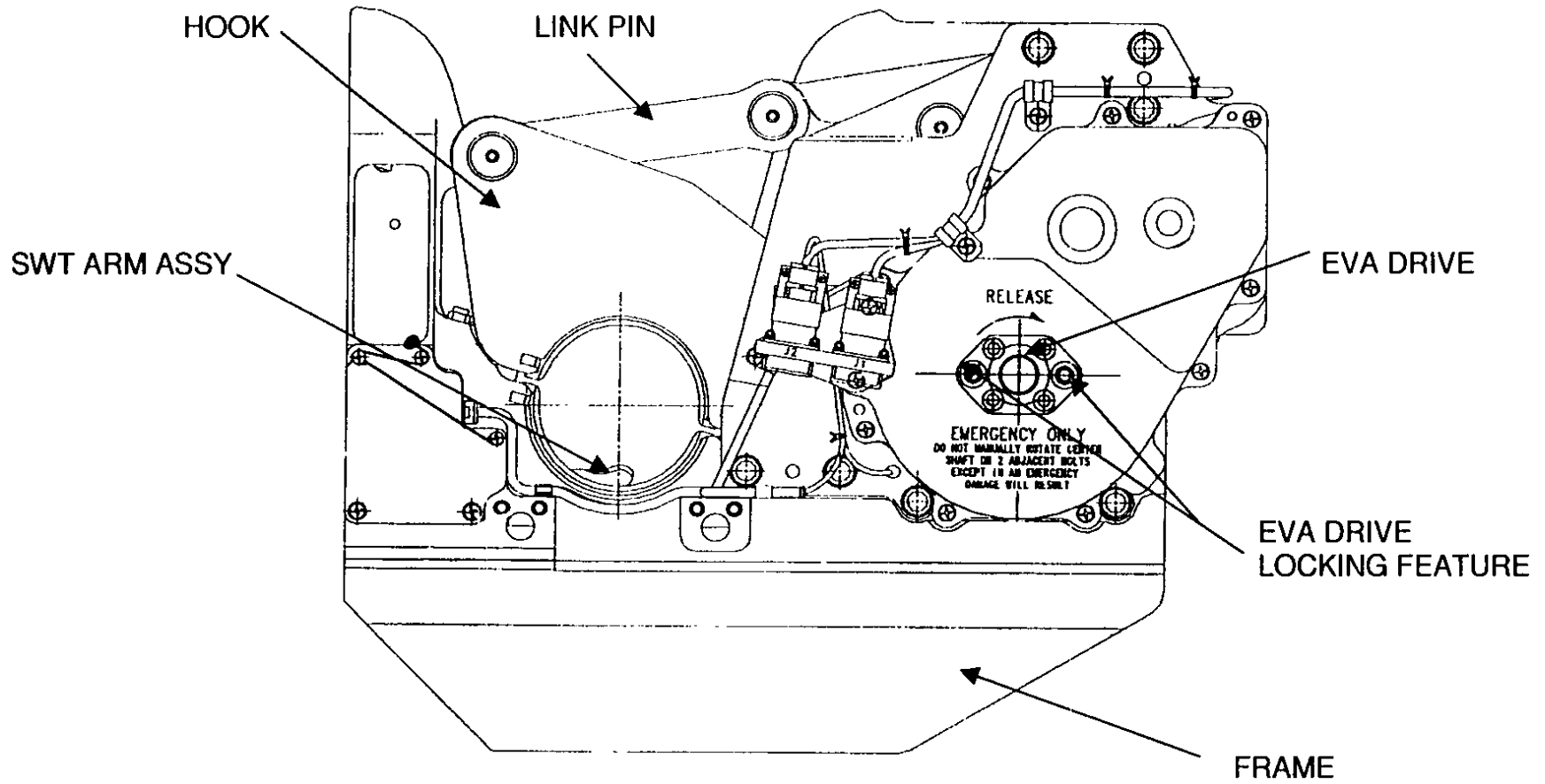
MODIFIED MIDDLEWEIGHT LATCH

173253111. ART, 1

EVA RELEASABLE PAYLOAD RETENTION LATCHES

RMS/PRLA CONTINGENCY EVA (Cont)

In-board end of shaft extends to show yellow stripe when motor disengaged



STANDARD WEIGHT LATCH

EVA RELEASABLE PAYLOAD RETENTION LATCHES (Cont)

96 BOLT PRE-EVA TOOL CONFIG

STOWAGE LOCATIONS AT LAUNCH

Flight specific Middeck stowage and PFR configuration will be uplinked

EMUs:	Node Bag:	Configure Crewlock EVA Bag:
MWS Baseplates (2)	96 Bolt Bag:	PGT Spare Battery
Retractable Tethers (2)	7/16-in Box End Wrenches (2)	Socket Caddies w/6-in Exts (2), RAD (Spare)
Adj Equip Tethers (2)	ODS Clamps (2)	
Waist Tethers (4)	ODS Clamp Handles (2)	Configure Adj Fuse Tether with one of following:
	PB Articulating Socket	GP Caddies (2)
Middeck:	Bridge Rail Clamp	PGTs w/Batteries (2)
MWS T-bars (2)	RAD w/7/16-in Sockets (2)	
MWS Swing Arms (3)		
BRT (2)	TSA (Port):	
Waist Tethers Ext (2) (If flown)	Large Cutter	Stow Adj Fuse Tether, Crewlock Bag, Jettison
General Purpose (GP) Caddies (2)	PRDs (2)	Stowage Bag in Airlock pre-EVA
Adj Equip Tethers (2)	Sm EVA Trash Bags (2)	
Retractable Tethers (2)		
Crewlock Bag	Fwd Bulkhead:	
Right Angle Drive (RAD)	PFR	Remove ODS Centerline Camera pre-EVA
Socket Caddy		
6-in Exts (2)	Port PLB (Bay 2):	
PGTs (2)	Bridge Rail Clamp	
PGT Batteries (3)	PB Articulating Socket	
Adj Fuse Tether		
Jettison Stowage Bag		

96 BOLT EVA TIMELINE

PET	IV/RMS	EV1	EV2
-40:00	√DOCKING MECHANISM POWERDOWN (RNDZ, APDS) before start of DEPRESS		
	ML86B:D 1. cb MNA MMU GN2 SPLY ISOL VLV A – cl		
	R13L 2. MMU GN2 SPLY ISOL VLV A – CL (tb-CL)		
-00:25	ML86B:D 3. cb MNA MMU GN2 SPLY ISOL VLV A – op	1. Perform DEPRESS (<u>DEPRESS/REPRESS</u>)	2. Perform DEPRESS (<u>DEPRESS/REPRESS</u>)
-00:20	Confirm TCS powerdown		
00:00	MET at PWR – BATT _____/_____:____	3. Perform POST DEPRESS (<u>DEPRESS/REPRESS</u>)	4. Perform POST DEPRESS (<u>DEPRESS/REPRESS</u>)
00:15		5. Perform <u>AIRLOCK EGRESS</u> (CUFF C/L, 47) Add the following steps to AIRLOCK EGRESS:	6. Perform <u>AIRLOCK EGRESS</u> (CUFF C/L, 47) Add the following steps to AIRLOCK EGRESS:
00:30		6a. Translate to GO2 ISOLATION VALVE on outside of airlock (aft port side)	
	AW64L(E)	6b. Open thermal cover; remove PIP pin	
		6c. GO2 XFER ISO VLV – CL AW64L(E)	
		6d. Re-install PIP pin; close thermal cover	
	GN2 XFER PANEL GO2 XFER PANEL		6e. √ODS hatch ΔP < 0.5
			6f. Open ODS Hatch per decal
			6g. Remove docking lights (two): Release elec connector (one) at each light PIP pin (one) on each light boom; stow in bag
			6h. Remove Cross-Hair assembly; stow in bag
			6i. VENT – OP; FLOW – OP GN2 XFER PANEL
			6j. VENT – OP; FLOW – OP GO2 XFER PANEL
			6k. √Pressure gauges (two) – zero
			6l. Close ODS hatch per decal
			6m. √ODS Equal vlvs (two) capped

96 BOLT EVA TIMELINE (Cont)

PET	IV/RMS	EV1	EV2
02:05	Record Cables cut at following locations: Bolt 32 – 1 cable _____ Bolt 24 – 7 cables _____ Bolt 21 – 1 cable _____ Bolt 19 – 1 cable _____ Bolt 1 – 1 cable _____ Bolt 95 – 2 cables _____ Bolt 74 – 2 cables _____ Bolt 69 – 3 cables _____ Line 69 – 1 line N2 _____ Line 66 – 1 line O2 _____ Bolt 51 – 1 cable _____ Bolt 47 – 2 cables _____ PGT: 25.5 ft-lb, CCW2, 30.5	<p><u>IF PFR REQUIRED:</u></p> <ol style="list-style-type: none"> 1. Retrieve Art Socket and Bridge Rail Clamp from 96 Bolt Bag 2. Install bridge rail clamp and art socket on stbd bridge rail in aft-most available half-hole, knob inboard 3. Retrieve PFR from port side <p><u>PFR SETUP FOR CLAMP INSTALL</u></p> <ol style="list-style-type: none"> 1. Art Socket: P = 2, Y = 6 2. PFR: P = 10, R = A, Y = 8 <div data-bbox="697 636 1201 740" style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Cut ends of O2 and N2 lines present sharp edge hazard</p> </div>	<p><u>IF PFR REQUIRED:</u></p> <p>Port Bridge Rail Clamp and Art Socket launched in second to fwd-most available half-hole</p> <ol style="list-style-type: none"> 1. Move clamp assy to fwd-most available half-hole, knob inboard 2. Retrieve fwd bulkhead PFR and install <p><u>PFR SETUP FOR CLAMP INSTALL</u></p> <ol style="list-style-type: none"> 1. Art Socket: P = 1, Y = 6 2. PFR: P = 10.5, R = A, Y = 3 <div data-bbox="1390 636 1894 740" style="border: 2px solid black; padding: 5px; text-align: center;"> <p><u>WARNING</u> Cut ends of O2 and N2 lines present sharp edge hazard</p> </div> <p><u>CUT CABLES AND LINES</u></p> <ol style="list-style-type: none"> 1. Use Large Cutter to cut all cables at 96 bolt interface 2. Bend cables w/cutter to verify cables separated 3. Cut O2 and N2 lines 4. Stow Large Cutter on available handrail
03:15		<p><u>USE BRT FOR BOLT RELEASE</u></p> <ol style="list-style-type: none"> 1. Release bolts 1-33, 40-48 and grounding strap between bolts 9 and 10 <p><u>SURVEY VESTIBULE</u></p> <ol style="list-style-type: none"> 1. ✓All bolts except 34,39,82,87 locked up 2. ✓All cables cut (21), all gas lines cut (two), and ground strap removed 3. ✓All tools, tethers removed from vestibule 4. ✓Separation plane clear of all cables and lines 	<p><u>USE BRT FOR BOLT RELEASE</u></p> <ol style="list-style-type: none"> 1. Release bolts 49-81, 88-96 <p><u>SURVEY VESTIBULE</u></p> <ol style="list-style-type: none"> 1. ✓All bolts except 34,39,82,87 locked up 2. ✓All cables cut (21), all gas lines cut (two), and ground strap removed 3. ✓All tools, tethers removed from vestibule 4. ✓Separation plane clear of all cables and lines

96 BOLT EVA TIMELINE (Cont)

PET	IV/RMS	EV1	EV2						
<p>03:25</p> <p>03:50</p> <p>04:00</p> <p>04:05</p>	<p>√FREE DRIFT PGT: 25.5 ft-lb, CCW2, 30.5</p> <p>Give EV GO for Clamp Release</p> <p>SEPARATION BURN</p>	<p><u>PREP FOR RELEASE</u></p> <ol style="list-style-type: none"> 1. Receive PRD from temp stow on Truss 2. Attach PRD fixed end to handrail, retractable end to Clamp Handle 3. Before releasing last two bolts, √FREE DRIFT 4. Release bolts 34,39; pull to lock up 5. Notify IV, GO for Clamp Release <p><u>CLAMP RELEASE</u></p> <ol style="list-style-type: none"> 1. Retract Clamp Handle pip pin; √green stripe visible <table border="1" data-bbox="655 678 1239 797"> <tr> <td style="text-align: center;"><u>CAUTION</u></td> </tr> <tr> <td>Posn body below separation plane for clamp release</td> </tr> <tr> <td>During clamp release, do not apply any sideload on ODS gusset (may puncture A/L)</td> </tr> </table> <ol style="list-style-type: none"> 2. Coordinate with IV and give EV2 short count for simo release 3. Simo with EV2, pull on PRD strap to open clamp 4. After clamp open, inform IV, "Clamp open and EV1 clear" <p><u>CLEANUP</u></p> <ol style="list-style-type: none"> 1. Translate to TSA w/96 Bolt Bag Remove Right Angle Drives (two) from PGTs (two) using pip pin on 96 Bolt Bag; stow in 96 Bolt Bag 2. Remove ODS Clamp and Handle from ODS gusset; stow Clamp, Handle, 7/16-in Box End Wrench in 96 Bolt Bag 3. Stow Waist Tether on EMU 4. Remove and stow 96 Bolt Bag in airlock 5. Stow PRD, Trash Bag in Port TSA <p>IF USED:</p> <ol style="list-style-type: none"> 6. Configure stbd PFR assy for landing: Bridge Rail Clamp: second to aft-most available half-hole; √knob locked 7. Art Socket: P = 11.5, Y = 3; √locked 8. PFR to EV2 port side 	<u>CAUTION</u>	Posn body below separation plane for clamp release	During clamp release, do not apply any sideload on ODS gusset (may puncture A/L)	<p><u>PREP FOR RELEASE</u></p> <ol style="list-style-type: none"> 1. Receive PRD from temp stow on Truss 2. Attach PRD fixed end to handrail, retractable end to Clamp Handle 3. Before releasing last two bolts, √FREE DRIFT 4. Release bolts 82,87; pull to lock up 5. Notify IV, GO for Clamp Release <p><u>CLAMP RELEASE</u></p> <ol style="list-style-type: none"> 1. Retract Clamp Handle pip pin; √green stripe visible <table border="1" data-bbox="1348 678 1932 797"> <tr> <td style="text-align: center;"><u>CAUTION</u></td> </tr> <tr> <td>Posn body below separation plane for clamp release</td> </tr> <tr> <td>During clamp release, do not apply any sideload on ODS gusset (may puncture A/L)</td> </tr> </table> <ol style="list-style-type: none"> 2. Simo with EV1, pull on PRD strap to open clamp 3. After clamp open, inform IV, "Clamp open and EV2 clear" <p><u>CLEANUP</u></p> <ol style="list-style-type: none"> 1. Translate to TSA 2. Stow PGTs (two) on Adj Fuse Tether 3. Stow Adj Fuse Tethers in airlock 4. Remove ODS Clamp and Handle from ODS gusset; stow Clamp, Handle, 7/16-in Box End Wrench in 96 Bolt Bag 5. Stow Waist Tether on EMU 6. Stow Large Cutter, Trash Bag, PRD in Port TSA 7. Close TSA door, close all latches <p>IF USED:</p> <ol style="list-style-type: none"> 8. Configure port PFR socket assy for landing: Bridge Rail Clamp: second to fwd-most available half-hole; √knob locked 9. Art Socket: P = 11.5, Y = 3; √locked 10. PFR: P = 10, R = A, Y = 6; √locked 	<u>CAUTION</u>	Posn body below separation plane for clamp release	During clamp release, do not apply any sideload on ODS gusset (may puncture A/L)
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96 BOLT EVA TIMELINE (Cont)

PET	IV/RMS	EV1	EV2
04:40		<u>VERIFY 96 BOLT BAG STOWAGE</u> ODS Clamps (2) ODS Clamp Handles (2) Right Angle Drives with 7/16-in Socket (2) 7/16-in Box End Wrenches (2)	<u>VERIFY AIRLOCK STOWAGE</u> Adj Fuse Tethers PGTs w/batteries (2) GP Caddies (2) ODS Thermal Blankets with Adj Equip Tethers (2) 96 Bolt Bag Crewlock Bag: PGT spare battery Socket Caddy w/6-in Exts (2), RAD
05:15		<u>PERFORM AIRLOCK INGRESS, CUFF C/L, 30</u> √EMU equipment: MWS w/swing arm BRT Retractable Tethers (2) Adj Equip Tethers (2) Waist Tethers (2)	<u>PERFORM AIRLOCK INGRESS, CUFF C/L, 30</u> √EMU equipment: MWS w/swing arm BRT Retractable Tethers (2) Adj Equip Tethers (2) Waist Tethers (2)
05:30			

CAPTURE LATCH MANUAL RELEASE (ODS/PMA)

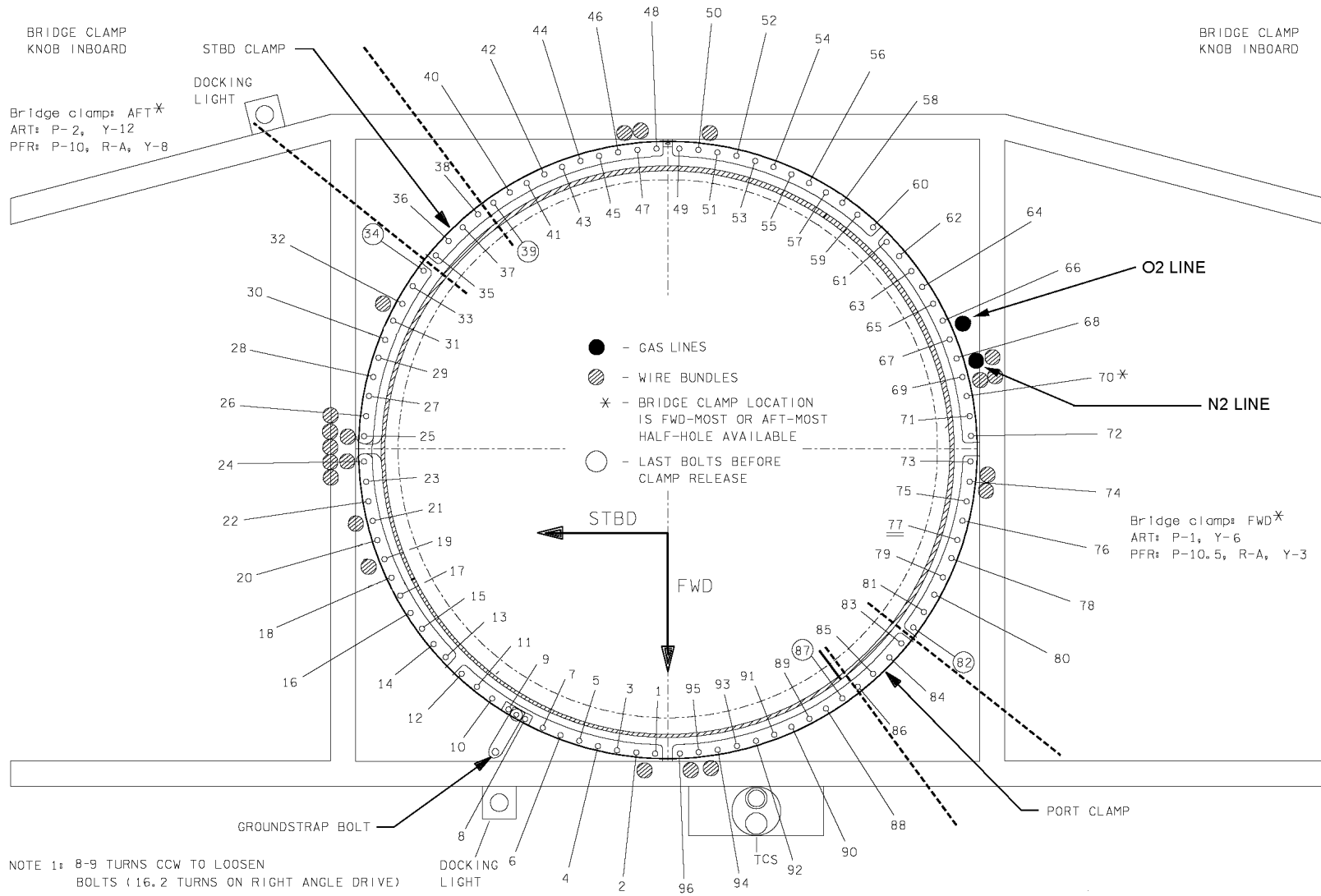
IV	EV
<p>A7 If APDS powered: pb PWR OFF – push √STATUS Lt (eighteen) – off Perform DOCKING MECHANISM POWERDOWN (RNDZ, <u>APDS</u>)</p> <p>Cont next page</p>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p style="text-align: center;">TOOLS REQD</p> <p>Jettison Stowage Bag Russian Capture Latch Tool (if reqd, in Node Bag)</p> </div> <p>BOTH 1. Configure Waist Tethers as safety line inside ODS</p> <p>EV1 Attach at ODS Hatch D-ring nearest capture latches</p> <p>EV2 Attach at A/L D-ring behind EV1</p> <p>EV2 2. Open outer hatch to improve EMU sublimator performance</p> <p>EV1 3. ODS/PMA interface: Open ODS hatch Remove docking lights (two): Release elec connector (one) at each light pip pin (one) on each light boom Stow lights and booms in bag</p> <p style="text-align: center;"><u>NOTE</u> EV2 restrain/aid EV1 as reqd</p> <p>EV1 4. Remove Cross-Hair assembly Stow in bag</p> <p>5. √IV GO for release</p> <p>6. Release capture latch</p> <p>Cont next page</p>

CAPTURE LATCH MANUAL RELEASE (ODS/PMA) (Cont)

IV	EV
	<p style="text-align: center;"><u>NOTE</u> If reqd, EV2 retrieve Russian Capture Latch Tool from Node Bag (requires safety tether reel ops)</p> <p>7. Notify IV when capture latch released</p> <p>8. Close hatch at capture latch interface</p> <p>EV2 9. If used, temp stow Russian Capture Tool in A/L and perform AIRLOCK INGRESS (CUFF C/L, 30)</p> <p>10. Close outer hatch</p> <p>BOTH 11. Go to A/L REPRESS</p>

I

96 BOLT EVA LAYOUT



NOTE 1: 8-9 TURNS CCW TO LOOSEN
BOLTS (16.2 TURNS ON RIGHT ANGLE DRIVE)

480240188. ART: 2

PLBD LATCH TOOL PLACEMENT WITH DUAL LATCH GANG FAILURES

CASE*	FAILED GANG 1	FAILED GANG 2	Three Point Latch Tool Positions Cuff C/L, 37		Centerline Latch Tool Positions Cuff C/L, 38	
			FWD #2**	FWD #4**	-	-
A	Fwd Bulkhead Port	Fwd Bulkhead Stbd	FWD #2**	FWD #4**	-	-
B	Fwd Bulkhead Port	Centerline Fwd	FWD #2	FWD #4	CL #1	CL #2
C	Fwd Bulkhead Stbd	Centerline Fwd	FWD #2	FWD #4	CL #1	CL #2
D	Centerline Fwd	Centerline Mid Fwd	-	-	CL #5	CL #6
E	Centerline Mid Fwd	Centerline Mid Aft	-	-	CL #7	CL #8
<p>*Other combinations of Two-Gangs Out involve doors in the crush pressure zone (latches in compression) or have at least one closed gang between failed gangs (no tension loads bleeding between gangs, giving load distributions identical to single latch gang failures)</p> <p>**Install both 3-pt tools on same side (Port or Stbd)</p>						

EVA CUFF CHECKLIST

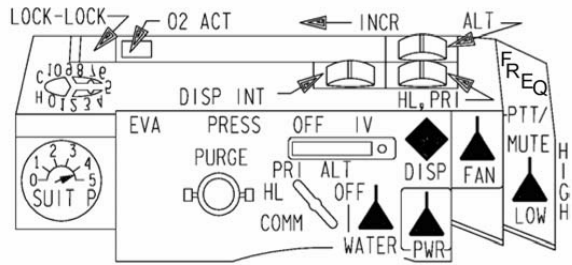
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KU ANTENNA STOW (CONT) 15-13
AIRLOCK EGRESS 15-13

EVA CUFF C/L

EVA CUFF C/L

	<p style="text-align: center;">NORMAL EVA STATUS</p> <table border="1"> <tr><td>O2 POS</td><td>EVA</td></tr> <tr><td>SUBLM P</td><td>2.0-4.2 psia</td></tr> <tr><td>TIME EV</td><td>HR:MIN since PWR-BATT</td></tr> <tr><td>TIME LF/limit consum</td><td>HR:MIN remaining at present use rate</td></tr> <tr><td>% O2 (PWR) LF</td><td>Non-limiting consumable will be displayed</td></tr> <tr><td>SUIT P</td><td>4.2-4.4 (4.7 during/after depress) psid</td></tr> <tr><td>O2 P</td><td>150-900 psia</td></tr> <tr><td>O2 RATE</td><td>0-4.0 psi/minute</td></tr> <tr><td>SOP P</td><td>5410-6800 psia</td></tr> <tr><td>BAT VDC</td><td>≥ 16.7</td></tr> <tr><td>BAT AMP</td><td>3.0-4.0</td></tr> <tr><td>RPM</td><td>18.0-20.0 K</td></tr> <tr><td>CO2</td><td>0.2-4.0 mm</td></tr> <tr><td>H2O TEMP</td><td>32-75 degF</td></tr> <tr><td>H2O GP</td><td>14.0-16.0 psid</td></tr> <tr><td>H2O WP</td><td>14.0-16.0 psid</td></tr> <tr><td>DATA?</td><td>COMBO</td></tr> <tr><td>BATT</td><td>32.0 AH (as directed by MCC-H)</td></tr> <tr><td>GAUGE</td><td>4.2-4.4 psid (4.7 during/after depress) psid</td></tr> </table> <p style="text-align: right;">1 03/10/06</p>	O2 POS	EVA	SUBLM P	2.0-4.2 psia	TIME EV	HR:MIN since PWR-BATT	TIME LF/limit consum	HR:MIN remaining at present use rate	% O2 (PWR) LF	Non-limiting consumable will be displayed	SUIT P	4.2-4.4 (4.7 during/after depress) psid	O2 P	150-900 psia	O2 RATE	0-4.0 psi/minute	SOP P	5410-6800 psia	BAT VDC	≥ 16.7	BAT AMP	3.0-4.0	RPM	18.0-20.0 K	CO2	0.2-4.0 mm	H2O TEMP	32-75 degF	H2O GP	14.0-16.0 psid	H2O WP	14.0-16.0 psid	DATA?	COMBO	BATT	32.0 AH (as directed by MCC-H)	GAUGE	4.2-4.4 psid (4.7 during/after depress) psid	<p>DCM CONFG INDEX</p>																																																						
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NO VENT FLOW	20																																																																																													

<p style="text-align: center;">SUIT P LOW</p> <p>SUIT P LOW SUIT P X.X</p> <p>If O2 USE HIGH msg present: 1. Go to ABORT EVA, 6 >> If O2 USE HIGH msg not present: 2. Continue EVA, monitor SUIT P, SOP P, and gauge If gauge < 4.0 and SOP P decreasing: 3. Go to TERM EVA, 7</p> <p>SUIT P LO SUIT P HI</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when SUIT P < 4.05</p> <p style="text-align: right;">12 05/11/06</p>	<p style="text-align: center;">SUIT P HIGH</p> <p>SUIT P HIGH O2 RATE XX.X SOP RATE XXX</p> <p>If O2 RATE > 7.0 or SOP RATE > 8: 1. Go to TERM EVA, 7 >> If O2 RATE < 7.0 and SOP RATE ≤ 8: 2. Monitor SUIT P, SOP P, and gauge 3. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when SUIT P > 4.55 Normal O2 RATE ≈1.7 psi/min</p> <p style="text-align: right;">SOP LOW O2 USE</p> <p style="text-align: right;">13 05/11/06</p>
<p style="text-align: center;">SOP P LOW</p> <p>SOP P LOW SOP P XXX0 SOP RATE XXX</p> <p>1. Go to TERM EVA, 7</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when SOP P < 4500, or SOP P < init SOP P – 600 (SOP P initialized at EMU powerup)</p> <p>SOP LOW O2 USE</p> <p style="text-align: right;">14 05/11/06</p>	<p style="text-align: center;">O2 USE HIGH</p> <p>O2 USE HIGH O2 RATE XX.X</p> <p>If SUIT P LOW msg present: 1. Go to ABORT EVA, 6 >> If O2 P erratic or ~0: 2. Continue EVA 3. Recharge O2 periodically >> If O2 RATE > 7.0: 4. Go to TERM EVA, 7 >> Otherwise: 5. Recharge O2 as reqd 6. Continue EVA</p> <p style="text-align: center;"><u>NOTE</u> Msg triggered when: O2 RATE > 10.2 psi/min or O2 P < 150 and TIME EV < 5 hr Normal O2 RATE ≈1.7 psi/min</p> <p style="text-align: right;">SUBLM PRESS H2O GP</p> <p style="text-align: right;">15 05/11/06</p>

MISC MSGS (CONT) / TIME LF

MISC 2
A/L
DISC

FAN SW OFF
H2O IS OFF
O2 ACT FAULT
O2 IS OFF
SET H2O OFF
SET O2 EVA
SET O2 PRESS
SCU PWR AVAL

Verify proper config

Consumables

XX% O2 LF	TIME LF 'MM
XX% PWR LF	TIME LF 'MM

Triggered with 30 min of calculated time remaining for limiting consumable

- Contact MCC to confirm calculation

- * If no comm with MCC: *
- * Go to TERM EVA, 7 *

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AIRLOCK LATCH DISCONNECT

TOOL BOX/A/L – ADJ WRENCH, RATCHET WITH 7/16 SOCKET
TOOL BOX – EVA TRASH BAG, ADJ TETHERS

- Remove bolt A, stow in trash bag
 - Rotate actuator handle
- If no rotation – jammed actuator:
- Force latches open
 - Seal hatch w/repress and secure for Idg (IV)

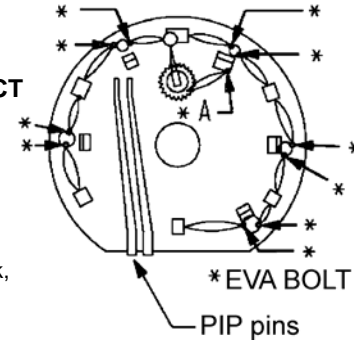
If free rotation – jammed latch:

- Locate and remove jam
- Reconnect actuator

HINGE DISCONNECT

TOOL BOX – ADJ TETHERS, VELCRO/TAPE

- Remove hinge PIP pins, as reqd
- Restrain hinge arm(s) and PIP pins clear of opening, ingress airlock, posn hatch for closing
- Close, lock hatch



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05/11/06

AIRLOCK INGRESS

- ✓TOOL BOX – closed, latched
- EV2**
- Ingress airlock
- EV1**
- Attach waist tether to A/L internal D-ring; lock hook
 - Attach EV2's safety tether, retracting end to waist tether; lock hooks
 - Disconnect EV1 safety tether, retracting end – attach to self
- BOTH**
- Ingress airlock
 - Unstow SCU, remove DCM cover, connect SCU to DCM (not reqd for tunnel adapter)
 - DCM WATER – OFF (fwd)
 - Thermal cover – close

CAUTION
Do not close hatch until EMU WATER is OFF for 2 min

- EVA hatch handle – pre close posn
- ✓EVA hatch seal clear, outer (EVA) hatch – close, lock
- Go to PRE REPRESS (DEPRESS/REPRESS Cue Card)

30

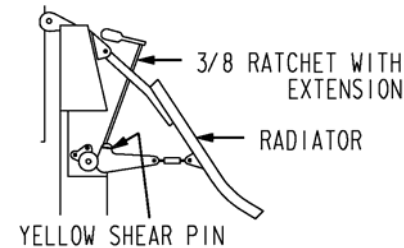
11/03/06

RADIATOR ACTUATOR DISCONNECT

IFM – 1/4-in ALLEN HEAD DRIVER
TOOL BOX – RADIATOR DISCONNECT/ 3/8 DRIVE RATCHET

- IV** ✓Pwr off
- Actuator disc sequence – aft to fwd
- Yellow shear pins (4) – retract to stop (6 revs ccw)
- When all actuators are disengaged:
- Manually close radiator panels and hold

- IV** ✓Pwr on
- IV** Latches – close



NOT IN EV CUFF

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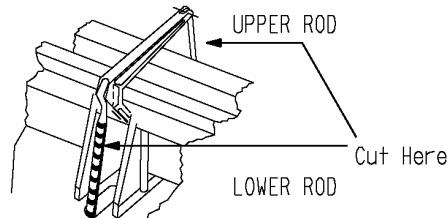
PLBD DRIVE CUT

TOOL BOX – TUBE CUTTER, VELCRO/TAPE

IV √Pwr off

Cut #1, stow antenna if stbd side, perform WINCH OPS, 35, steps 1,2, then cut #6 thru #2 and perform WINCH OPS, 36, steps 3-7

BANDS VISIBLE	CORRECTIVE ACTION
1-6	Cut upper rod in middle and restrain (27)
7-10	Cut lower rod between 2nd and 3rd bands from top and restrain (27)



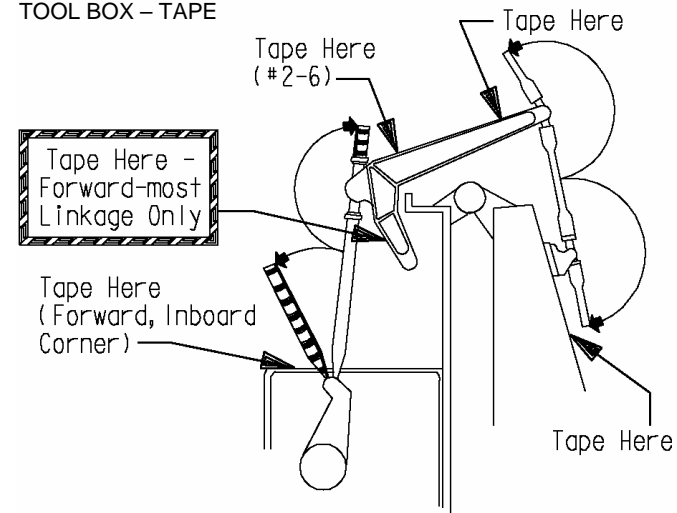
NOT IN EV CUFF

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DOOR DRIVE RESTRAINT

TOOL BOX – TAPE



NOT IN EV CUFF

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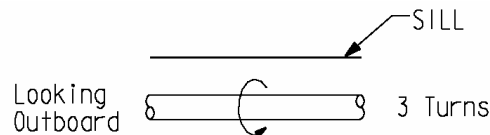
03/20/06

DOOR DRIVE DISCONNECT

TOOL BOX – PDU DISC TOOL, TRASH BAG

IV √Pwr off

1. Perform WINCH OPS, 35, steps 1,2
2. Remove fabric cover(s)
3. Insert Disc Tool in Door Drive PDU
Xo – 798, port OR stbd
4. Rotate tool cw to stop (60 deg) and leave tool in PDU
5. Rotate torque shaft at least 3 turns (see below)
6. Perform WINCH OPS, 36, steps 3-7
7. If reqd for other door, rotate tool ccw 60 deg and remove from PDU

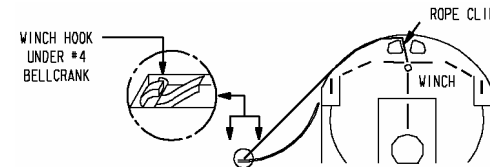


NOT IN EV CUFF

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WINCH OPERATIONS



IV Radiators – stow and latch

1. Winch
CONTROL – REEL OUT
Handle ratchet – blue (center)
Attach rope to wrist tether
Rope: Fwd – in clip and over rollers
Aft – rope guide, under handrail, and over rollers
Winch hook – under #4 latch bellcrank
CONTROL – IN
Handle ratchet – green (cw)
2. Ratchet in rope slack only

Cont next pg

NOT IN EV CUFF

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03/20/06

WINCH OPERATIONS (CONT)

- IV** √Pwr off
 3. PLBD(s) – close with winch
 If aft not READY TO LATCH, repeat steps 1 and 3 at aft winch
- IV** √Pwr on
- IV** Latches – close
4. Winch hook – remove from PLBD
 5. Rope – reel in excess
 6. Handle – stow
 7. Repeat steps 5-7 for aft winch, if reqd

NOT IN EV CUFF

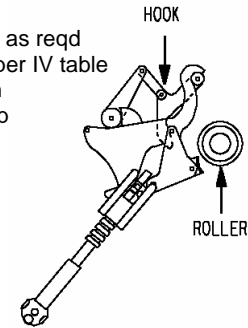
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3-PT TOOL INSTALLATION

TOOL BOX – 3-PT TOOLS, ADJUSTABLE TETHERS

- IV** √Pwr off
1. Position installation handles as reqd
 2. Tools – install in sequence per IV table
 3. Ratchet select lever – green
 4. Handle – ratchet to hard stop – stow handle or restrain with Adj tether



TOOL RESET

1. Ratchet – red
2. Handle – ratchet to stop
3. Tool – compress to latch handles

NOT IN EV CUFF

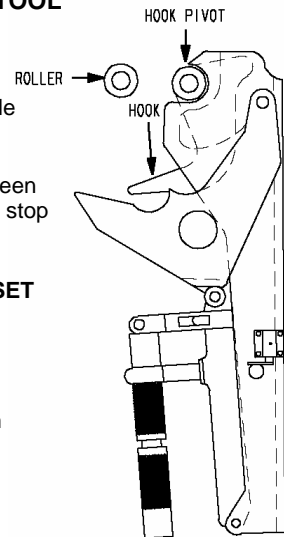
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03/20/06

CL LATCH TOOL

TOOL BOX – CL LATCH TOOLS

- IV** √Pwr off
1. Tools – install per IV table
 2. Trigger – safety off – depress
 3. Ratchet select lever – green
 4. Handle – ratchet to hard stop – stow



TOOL RESET

1. Ratchet – red
2. Handle – ratchet to stop – stow
3. Tool – compress to latch

STBD →
 03/20/06

NOT IN EV CUFF

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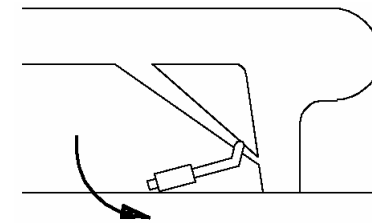
RMS JOINT ALIGN

TOOL BOX – ADJ TETHERS, SNATCH BLOCKS (2), RMS ROPE REEL

1. Attach RMS rope around end effector under handrail. Translate to avoid wrapping rope around RMS
 2. Attach snatch block(s) to handrail(s) and route rope as reqd
- IV**
3. Reposition RMS as required for cradling
 4. Pull RMS down into MPMs
 5. Perform final positioning by hand to allow MRLs to latch

RMS SHOULDER BRACE RELEASE

TOOL BOX – RMS SHOULDER BRACE RELEASE TOOL



1. Fold aside rub strip and thermal blankets
2. Insert tool and move handle down
3. Remove tool and reconfigure blankets

NOT IN EV CUFF

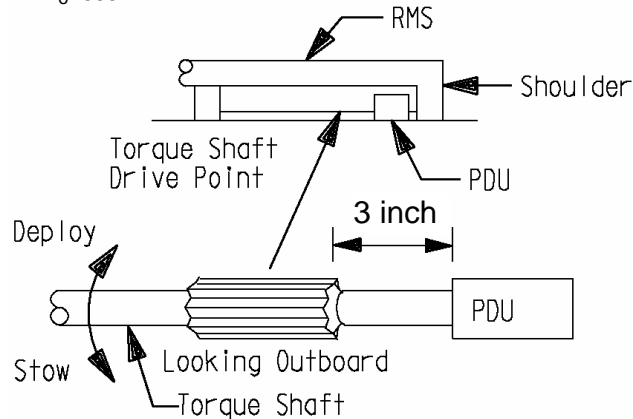
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MPM STOW/DEPLOY

TOOL BOX – MPM WRENCH

1. Rotate torque shaft (8 revs) until MPMs are stowed/deployed, X₀=693



NOT IN EV CUFF

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RMS TIEDOWN

TOOL BOX – PRDs (2), EVA TRASH BAG

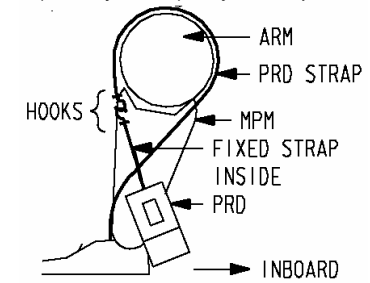
IFM – 9/64-in ALLEN WRENCH (AW)

ELBOW – PRD aft of MPM, peel blanket (fwd of MPM) toward EE; feed hook under cable harness (if reqd, remove cable harness clamp bolt with AW, bend clamp out of way), adjust strap as far fwd as possible

WRIST – PRD aft of MPM, strap rests just fwd of pitch joint opening

END EFFECTOR – PRD fwd of MPM, peel blankets aft and fwd, strap rests aft-most on yaw joint (at roll/yaw I/F), adjust strap under bolt studs

1. Figure eight the strap
2. Pull minimum 6-in slack in strap
3. Ratchet PRD snug, (14 full strokes reqd)
4. ✓Strap in correct arm location, ratchet tight
5. Reattach blankets



NOT IN EV CUFF

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RMS FLIGHT RELEASABLE GRAPPLE FIXTURE RELEASE

AIRLOCK – JETTISON STOWAGE BAG

TOOL BOX – 1/2-in BOX RATCHET, VELCRO/TAPE

- EV**
1. Rotate white release rod ccw to hard stop (32 strokes of 90 deg)
 2. Rotate black release rod cw to hard stop (32 strokes of 90 deg – shaft will release from grapple fixture)
 3. Clear worksite for RMS powerdown
 4. Tape end of shaft to restrain slug within shaft
 5. Cover end effector with jettison stowage bag to restrain grapple shaft

NOT IN EV CUFF

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PRLA OPEN/CLOSE

AIRLOCK – RATCHET WITH 7/16 SOCKET

IV ✓PRLA PWR OFF

- EV**
1. Rotate ratchet in release direction (as marked above EVA drive) to shear pin
 2. View yellow indicator as applicable
 3. Continue to rotate drive 4-1/2 revs to disc gear train from drive shaft

To open latch:

4. Continue rotation in release direction (as marked above EVA drive) until latch open against stop

To close latch:

5. Rotate EVA drive in opposite direction of release (as marked above EVA drive) until latch closed against hardstop and over center

IV ✓PRLA to LAT

Cont next pg

NOT IN EV CUFF

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PRLA OPEN/CLOSE (CONT)

- EV**
6. Apply PRLA locking feature if applicable
To lock:
 7. Rotate each bolt (two) cw 1/2 turn
- For subsequent PRLA ops, release locking feature before operating EVA drive (two bolts ccw 1/2 turn); relock after operation

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KU ANTENNA STOW

1. Secure tether reel clear of antenna dish with wrist tether

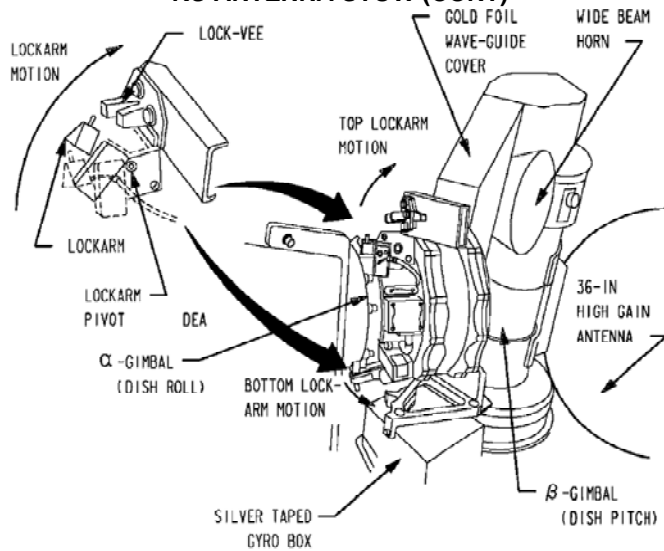
CAUTION
Antenna dish is very fragile. Avoid contact with gold thermal blankets and black painted surfaces

2. Align α (dish roll) and β (dish pitch) gimbals for pin engagement
3. Give IV GO to drive pins in short pulses

NOTE
Top lockarm (by wide beam horn and gold foil) drives fully before bottom lockarm (by silver gyro box)

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KU ANTENNA STOW (CONT)



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AIRLOCK EGRESS

DAISY CHAIN: EV2 waist tether to A/L internal D-ring
EV2 safety tether (retracting end) to EV1 waist tether

- EV1**
1. Thermal cover – open
 2. Egress airlock
 3. Attach safety tether, retracting end to ODS dogbone handrail (or orbiter handrail tether point); lock hook, \checkmark reel unlocked
 4. Attach EV2's safety tether, retracting end to separate ODS dogbone handrail; lock hook, \checkmark reel unlocked
- BOTH**
5. Waist tethers – attach to self, stow extra waist tether (if reqd) in A/L clear of hatch
- EV2**
6. Egress airlock
 7. Thermal cover – close

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FLIGHT SPECIFIC REFERENCE

----- FS REF -----

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UNSCHEDULED/CONTINGENCY EVA TASKS

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EVA REFERENCE

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EVA EMERGENCY

-----EVA EMERGENCY-----

----- EVA EMERGENCY -----

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EMERGENCY PROCEDURES

EMERGENCY AIRLOCK REPRESS 19-3
 EMERGENCY AIRLOCK REPRESS 19-4
 POST EMERGENCY AIRLOCK REPRESS 19-4
SAFER RESCUE 19-5
 SAFER RESCUE 19-6
DAP/EVA RESCUE/RETRIEVE 19-7
 EVA ORBITER CONFIG 19-7
 RESCUE/RETRIEVE 19-9
19.1 DCS TREATMENT 19-10

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EMERGENCY AIRLOCK REPRESS

EMERGENCY AIRLOCK REPRESS

NOTE: Ignore CWS functions

Outer (EVA) hatch – close and lock

Inner hatch Equal vlv (two) – EMER

AW82B: √AIRLK DEPRESS vlv – CL

DCM: WATER – OFF (fwd)

Open inner hatch

Go to POST EMERGENCY AIRLOCK REPRESS

POST EMERGENCY AIRLOCK REPRESS

WARNING

This procedure should not be performed following a Cuff 4 DCS incident

For affected crewmember:

- | | |
|-------|---|
| DCM | 1. PURGE vlv – op (up) |
| | 2. O2 ACT – OFF |
| | 3. √STATUS: SUIT P < 0.4 (compare with gauge) |
| | 4. Disconnect gloves |
| | 5. Disconnect helmet |
| | 6. Connect SCU to DCM |
| AW18H | 7. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB) |
| DCM | 8. PWR – SCU |

For unaffected crewmember:

- | | |
|-------|---|
| DCM | 9. O2 ACT – IV |
| | 10. Connect SCU to DCM |
| AW18H | 11. PWR/BATT CHGR EMU 1(2) BUS SEL – MNA(MNB) |
| DCM | 12. PWR – SCU |

If single crewmember aborting EVA:

- | | |
|--|---|
| | 13. Outer (EVA) hatch Equal vlv caps (two) – remove, stow |
| | 14. √MCC |

SAFER RESCUE

SAFER
RESCUE

SAFER RESCUE

1. Deploy SAFER HCM
2. PWR – ON
3. Wait for AAH, line up with separation point
Fly to vehicle
Monitor GN2% and PWR%

- * If no gas flow: *
- * √MAN ISOL vlv – OP (dn) *

- IV/other EV
4. Provide GCA (as reqd)
Provide range and range rate using Laser Range Finder, as reqd
Configure WVS and vehicle cameras to assist
Turn on external vehicle lights, as reqd
 5. Tether to nearest structure, √connection
 6. Tether to available safety tether or other EV crewmember, √connection
 7. PWR – OFF
 8. MAN ISOL vlv – CL (up)
 9. √MCC

SAFER
RESCUE

EVA ORBITER CONFIG

1. GENERIC ORBITER CONFIGURATION
A6U SENSE – as reqd
FLT CNTLR PWR – OFF
DAP TRANS: PULSE/PULSE/PULSE

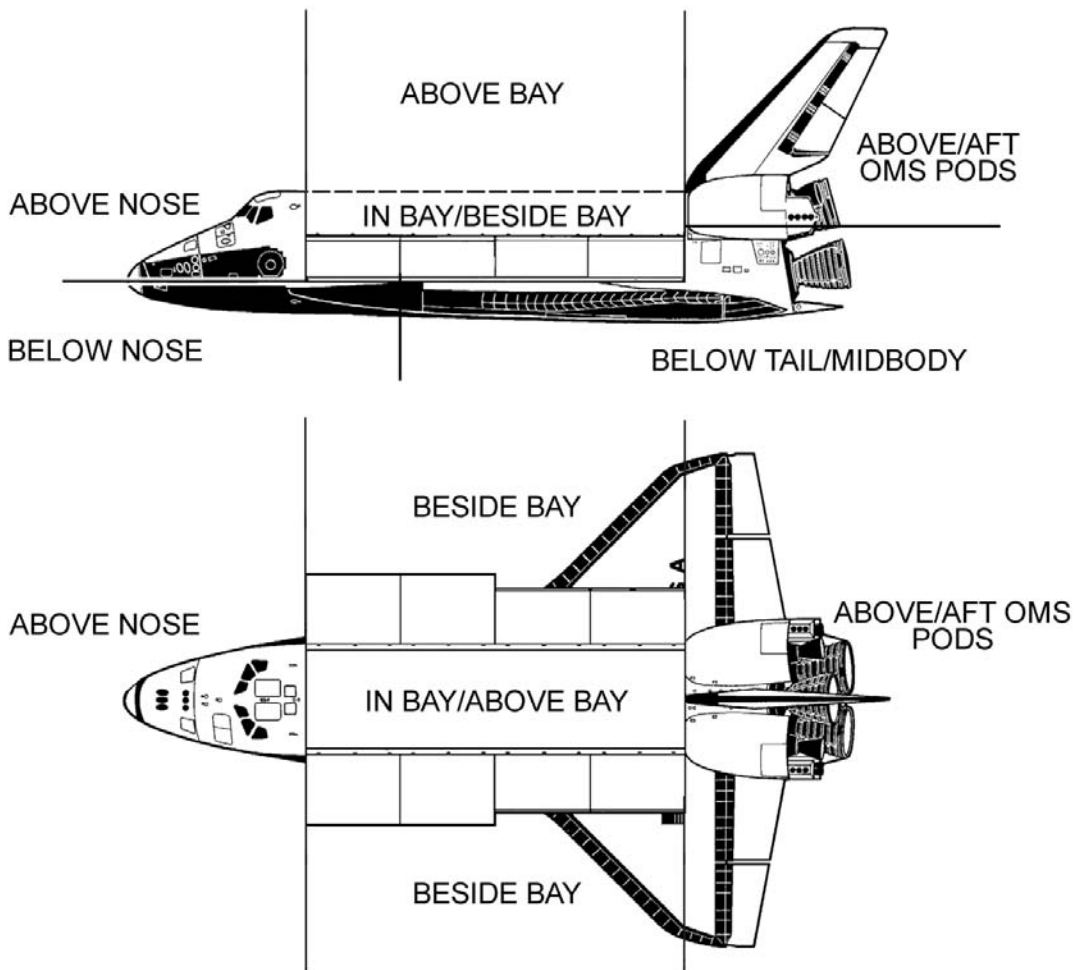
O14, cb MNA,C DDU AFT (two) – cl
O15, Pri RJD LOGIC,DRIVER (sixteen) – ON
O16

GNC 20 DAP CONFIG

CRT √PRI TRAN PLS – ITEM 17 +0.10
 √ITEM 37 +0.05

A1U √KU CNTL – CMD
 PWR – STBY

Unstow, review EVA RESCUE procedure



DAP/
EVA RESCUE

2. REGION-SPECIFIC ORBITER CONFIGURATION

Using region charts, determine region(s) in which EVA crewmembers will be located

Working in order top of table to bottom using the most restrictive region, configure orbiter systems per following table, performing any Initial Configuration Actions which contain a '√'

Items which do not have a '√' may be configured as desired to meet mission-specific requirements

WARNING
 Deviating from orbiter systems configuration called out in following table may put EVA crewmembers at risk of being plumed by RCS jets

NOTE

The following table should be used for initial configuration. It should not be used during the EVA (e.g., for EVA RESCUE).

If VERNs not available, use ALT instead. All other configuration actions remain unchanged

		In Bay	Above Bay	Above Nose	Above/Aft OMS Pods	Below Tail/Mirbody	Below Nose	Beside Bay
INITIAL CONFIGURATION ACTIONS								
D	VERN	√	√	√				√
A	ALT				√	√	√	
P	LOW Z		√					
	No LOW Z			√		√	√	
SPEC 20	P/Y/JET OPTION (PRI & ALT, DAP A & B) – ALL				√	√		
	P/Y/JET OPTION (PRI & ALT, DAP A & B) – TAIL			√			√	
SPEC 23	OVRD L/R MANFs 1,2,4 (six) – CL				√			
	L3L,R3R (two) – DES				√			
	OVRD L/R MANFs 2,3,4 (six) – CL					√		
	L1L,R1R (two) – DES					√		
O14,	RJDA L1/R1 (L2/R2, L4/R4) DRIVER (three) – OFF				√			
O15,	RJDA L2/R2 (L3/R3, L4/R4) DRIVER (three) – OFF					√		
O16	RJD MANF L5/F5/R5 DRIVER – OFF				√	√	√	
	RJDF F1(F2,F3,F4) MANF DRIVER – OFF (four)			√			√	
MISC	FLT CNTLR PWR (three) – OFF				√	√		√

3. POST-EVA RECONFIGURATION

Return orbiter to desired/required systems configs

DAP/
EVA RESCUE

EVA RESCUE/RETRIEVE

NOTE

Assumes that EVA ORBITER CONFIG procedure has already been performed

1. CONFIGURATION
- A6U DAP: FREE(INRTL)
- √SENSE SWITCH as desired
- O14:F, √Pri RJD LOGIC,DRIVER (sixteen) – ON
O15:F,
O16:F
- O16:F √RJD MANF L5/F5/R5 DRIVER – ON
- GNC 23 RCS
- A1U OVRD L/R MANF – OP (if OVRD CLOSED earlier)
KU CNTL – PNL

2. OPERATIONS

NOTE

When EVA crewmember clear of RCS jets,
FLT CNTLR PWR ON and DAP INRTL

If TRANSLATION:

| DAP: LO Z, as reqd (DAP A has larger TRANS PULSE size)

If ROTATION:

DAP: VERN(PRI), as reqd

NOTE

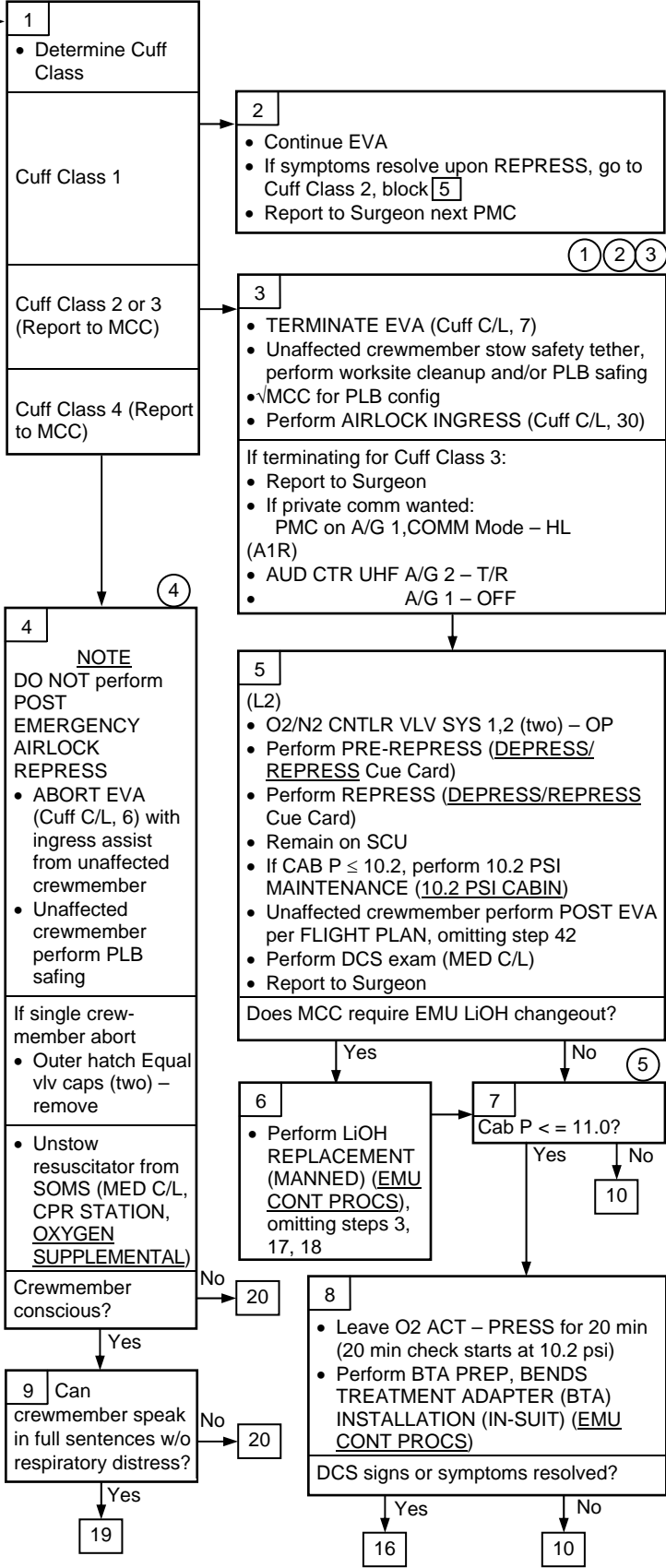
Translate, then rotate, as reqd to center crewmember over bay.

Null translational rates, then establish closing(opening) rate as reqd to crewmember in bay.

Use RMS and/or other EVA crewmember to assist if possible

19.1 DCS TREATMENT

DCS Signs and Symptoms Associated with Each Cuff Class Defined in Cuff C/L



① EVA terminated to prevent progression to Cuff Class 4. If Cuff 2, affected crewmember will assist other EV with minor worksite cleanup, if possible, to expedite cleanup and then terminate EVA

② If estimated time reqd for DCS treatment exceeds LiOH consumables, a changeout should be performed. If 10 or 12 reqd, minimum treatment is ~3 hr

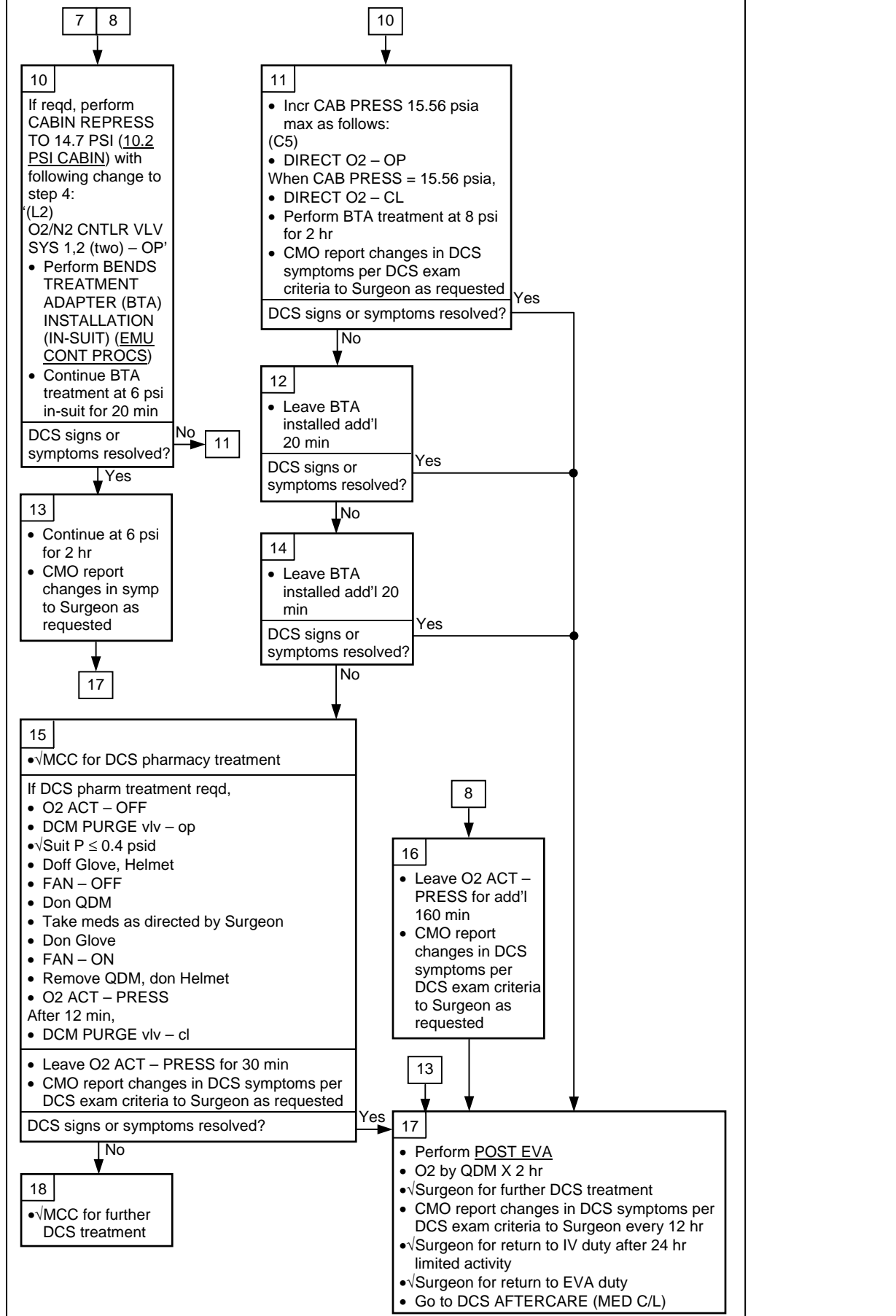
③ For Cuff 2 or 3, private comm not required to allow for expedited treatment. For Cuff Class 3 only, affected crewmember waiting in A/L needs to be in contact with Surgeon due to severity and potential progression of symptoms

④ Cuff Class 4 symptoms may be secondary to Type 2 DCS which is a medical emergency. Unstowing the resuscitator enables IV crew to be prepared to administer CPR, if reqd. Because it is critical to repress a Class 4 quickly, this may result in a one crewmember repress

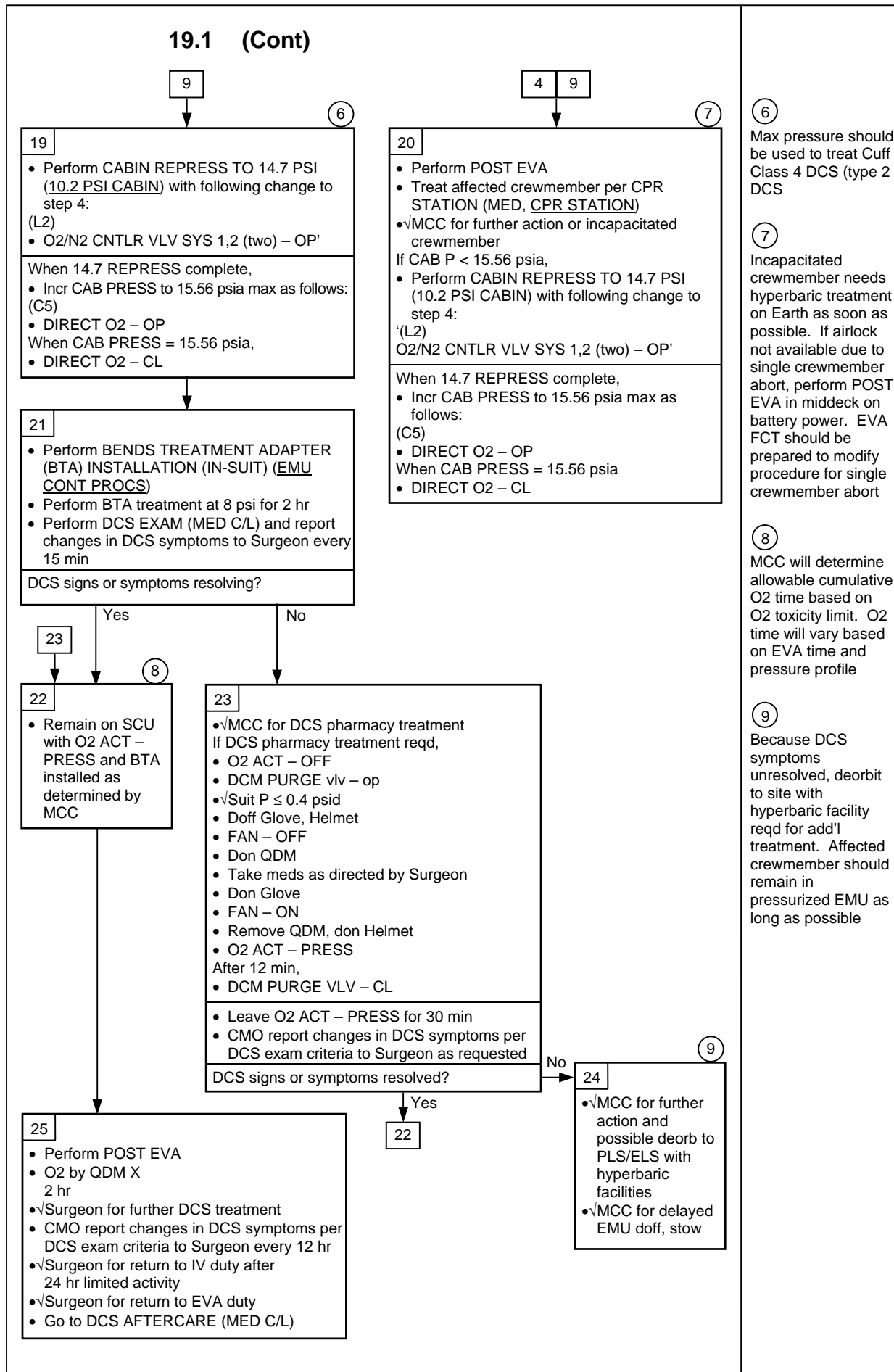
⑤ This decision block determines whether the cabin is being operated within 10.2 psi control range. Minor fluctuations above 10.6 have been seen; therefore, 11 psi was used to cover all 10.2 scenarios. Otherwise, cabin is being controlled at 14.7 psi

DCS PROC

19.1 (Cont)



19.1 (Cont)



⑥ Max pressure should be used to treat Cuff Class 4 DCS (type 2 DCS)

⑦ Incapacitated crewmember needs hyperbaric treatment on Earth as soon as possible. If airlock not available due to single crewmember abort, perform POST EVA in middeck on battery power. EVA FCT should be prepared to modify procedure for single crewmember abort

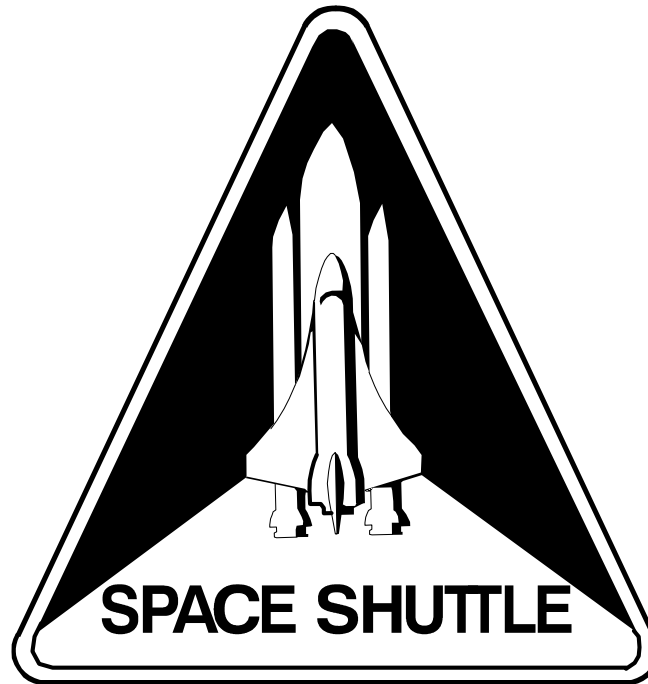
⑧ MCC will determine allowable cumulative O2 time based on O2 toxicity limit. O2 time will vary based on EVA time and pressure profile

⑨ Because DCS symptoms unresolved, deorbit to site with hyperbaric facility reqd for add'l treatment. Affected crewmember should remain in pressurized EMU as long as possible

CUE CARD CONFIGURATION

Refer to the following pages for cue cards and decals in this document:

- CC 3-10 SAFER CHECKOUT RESULTS Cue Card
- CC 3-11 SAFER STATUS TROUBLESHOOTING Cue Card
- CC A6-2 DEPRESS/REPRESS Cue Card (Nominal Config)
- CC B6-2 DEPRESS/REPRESS Cue Card (Tunnel Adapter)
- CC 6-4 FAILED LEAK CHECK Cue Card
- 19-4 EMERGENCY AIRLOCK REPRESS Decal



EVA CHECKLIST	STS ALL
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